VOL. 14 NO. 2 JULY - DECEMBER 2025
ISSN 3116-3742 e-ISSN 3116-3750

UERM MEDICAL CENTER
Research Institute for Health Sciences

UERM MEDICAL CENTER

Health Sciences Journal

From the desk. To the bench. To the bedside.

UERM MEDICAL CENTER
Health Sciences Journal
is published twice a year by the
University of the East Ramon Magsaysay Memorial Medical Center, Inc.
Research Institute for Health Sciences

James Alfred P. Danganan, PTRP, MEM
Physical Therapy

Elmer M. Garcia, MD
Pulmunology

Virgilio R. de Gracia, MD
Otorhinolaryngology

Jose Luis G. de Grano, MD
Ophthalmology

Maribeth T. de los Santos, MD, MSPH
Cardiology

John Christopher A. De Luna, PTRP, MSPH
Physical Therapy

Carmelita C. Divinagracia, RN, MAN, PhD
Nursing

Ivy Mae S. Escasa, MD
Hematology

Luis Emmanuel O. Esguerra, MD
Anatomy

Jennifer C. Espinosa, PTRP, MSAHP
Physical Therapy

Jocelyn A. Eusebio, MD
Developmental Pediatrics

Gracieux Y. Fernando, MD, MHPEd
Medical Oncology

Olivia C. Flores, MD, MEM
Anesthesiology

Benida A. Fontanilla, MD, MBA, MSTM
Microbiology & Parasitology

Ruby N. Foronda, MD
Pediatric Immunology & Allergy

Maria Cristina Gerolia-Alava, PTRP
Physical Therapy

Maribel Emma C. Hidalgo, MD
Obstetrics & Gynecology

Cecilia S. Hipolito, Jr., MD
Surgical Oncology

Araceli P. Jacoba, MD
Pathology

James B. Joaquino, MD
Plastic & Reconstructive Surgery

Jose Ronilo G. Juangco, MD, MPH
Preventive & Community Medicine

Odette S. Justo, PTRP, MRS
Physical Therapy

Ronald P. Law, MD, MPH
Public Health & Disaster Management

Efren C. Laxamana, MD, MBA, PhD
Medical Education / Ophthalmology

Maria Milagros U. Magat, MD, MEM
Biochemistry, Medical Education

Celine Ivie Manuel-Altarejos, PTRP, MSPH
Physical Therapy

Gabriel L. Martinez, MD
Trauma

Miguel C. Mendoza, MD
Minimally Invasive Surgery

Suzette III, Mendoza, MD, MHSE
Medical Education

Susan P. Nagtalon, MD, MSPH
Obstetrics & Gynecology

Nadia A. Pablo-Tedder, PTRP
Physica|Therapy

Rolando S. Padilla, MD
Neurological Surgery

Celso P. Pagatpatan, Jr., MSN, DrPH
Nursing, Social Science

Yves Y. Palad, PTRP, MSPH
Physical Therapy

Erlinda C. Palaganas, RN, MPH, PhD
Nursing

Mario M. Panaligan, MD, MSTM
Adult Infectious Diseases

Georgina T. Paredes, MD, MPH
Preventive & Community Medicine

Beatriz P. Quiambao, MD
Pediatric Infectious Diseases

Vinna Marie T. Quiñones, MD
Pediatrics

Milagros B. Rabe, MD, MSc, PhD
Physiology

Ignacio V. Rivera, MD
Pediatric Neurology

Hilda M. Sagayaga, MD
Vascular & Transplant Surgery

Jose B. Salazar, MD, MSPH
Neonatology

Jose Antonio M. Salud, MD, MHA
Hepatobiliary Surgery

Carmelita R. Salvador, MAEd-AS
General Education

Amado M. San Luis, MD, MPH
Adult Neurology / Palliative Care

Fria Rose Santos-De Luna, PTRP, MSPH
Physical Therapy

Vanessa L. Sardan, PTRP, MSPH
Physical Therapy

Isidro C. Sia, ILID, PhD
Herbal Medicine

Evelyn A. Siao, MD
Family and Community Medicine

Josephine Y. Sunga, MD
Pediatrics

Paul Anthony L. Sunga, MD
Urology

Alfred L. Tan, MD
Neurosurgery

Alyce Gail N. Arejola-Tan, MD
Pediatrics/ Pediatric Nephrology

Maria Petrina S. Zotomayor, MD
Pharmacology

Ricardo C. Zotomayor, MD
Pulmonology

Contents

65 Validation of the Bisaya translation of the Insulin Treatment Appraisal Scale (ITAS) and association between Psychological Insulin Resistance (PIR) and glycemic control among patients with type 2 Diabetes mellitus in a private clinic in Surigao City

Dysserie Krystal Palermo-Rivera, RN, MD, DPCP and Jose Carlo E. Ongchangco, MD, MHA

74 The effect of a neurological training module on the competency of neurocritical care staff nurses

Ruperto A. Asesor Jr., RN, MSN and Leonor V. Fruto, RN, MN

80 Resilience and burnout among medical students in blended learning: a correlational study

Nicole Anne O. Abonal, Lee Carron S. Aganda, Isaac Philip R. Aguilar, Hannah E. Calinisan, Catherine Fatima L. Canciller, PTRP, Wynona Angela O. Caña, Martina Micah R. Caparros, Ina Francesca C. Caramoan, Maria Alyssa A. Castillo, Amanda M. Palileo MD, Jose Ronilo G. Juangco, MD, MPH, FPSVI

87 *Saccharomyces boulardii* versus *Bacilus clausii* for the treatment of acute diarrhea: a systematic review and meta – analysis

Jose Ronilo G. Juangco, MD, Maribel Emma C. Hidalgo, MD, MSPH, Nanette Y. Ramilo-Cruz, MD; Raymond Oliver A. Cruz, MD; Kathryn Floro-Cruz, MD; Riezel Vanessa Abdon, MD; Ma. Leyhl Ann Nierves, MD, Shalemar Kasan MD, Jasmine Sanghilan, MD

95 The development and evaluation of the realism of an alternative prosthetic model for prosthetics and Physical Therapy education: the Pelvic-Femoral Learning Model (PFLM)

Rafael Nathaniel T. Mabasa, CPO, Joshua James V. Esguerra, CPO, Ma. Kristina E. Ayate, OTRP, Andrea Maxine T. Blanco, CPO, Allana Marie S. Sol, Maxene Giuliana G. Lina, Ram Austin B. Reyes, CPO, Japhet Gerard V. Regidor, CPO, MHCM, Rachelle Ann P. Ligan, RN, CPO

100 Isolation and detection of *Acanthamoeba spp.* in Tadlac Lake in Los Baños, Laguna

Therese A. Suratos, Jeune Marc William C. Paclibar, Lovely Camille S. Sayson, Patrick R. Relacion, Margarette L. De Los Santos, Jeremiah Gabrial C. Eleazar, Michaela T. Guingab, Simon Jorel B. Ngo, Kate Yzabhelle M. Ongtangco, Samantha Irene S. Razote, Richmond D. Sarmiento, Bill Ritchie C. Torre, Samantha Kary G. Valencia

106 Knowledge, attitudes, and practices of senior high school students in Manila city on Human Papillomavirus (HPV) infection and vaccination: a descriptive cross-sectional study

Japheth Mye S. Dinglasan, Joyce Belle S. Dinglasan, Angelica D. Dizon, Kirsten Danielle R. Doctora, Tricia Gale A. Domail, Shane Clarence C. Domingo, Andrei P. Duhaylungsod, Paula Mae A. Dychitan, Alexandrina E. Eboña, Charina C. Ebreo, Jan Rey S. Escano, Jasmine Lianne B. Esguerra, Marjorie M. Espedido, Arienne Therese P. Evangelista, Kimberly F. Eviza, Jose Ronilo G. Juangco, MD, MPH, Maribel Emma Co-Hidalgo, MD, MSPH

Editorial Conflict of Interest Disclosure

Editors

As part of good publication practices, all editors of the UERMMMC Health Sciences Journal (Editor-in-Chief and Associate Editors) are required to disclose on an annual basis, any potential conflict of interest, including current or recent financial relationships with any commercial entity whose products or services may be contained in the journal content. Disclosure represents a commitment to transparency and does not necessarily indicate a bias. This policy follows the recommendations of the International Committee of Medical Journal Editors (ICMJE) and the Committee on Publication Ethics (COPE).

Reviewers

Reviewers must assess potential conflicts of interest before accepting a manuscript for review and disclose any that may affect their impartiality. If a conflict exists, they should decline the review. Reviewers are expected to follow the Committee on Publication Ethics (COPE) Ethical Guidelines for Peer Reviewers, maintain confidentiality, and avoid using or sharing unpublished data. They must not use the peer review process to advance their own work or require citations to their own publications unless genuinely relevant.

Authors

All authors must disclose any financial, personal, institutional, or intellectual conflicts of interest related to the manuscript. This includes ownership of stocks, consultancy roles, honoraria, travel support, patent rights, or other benefits from products discussed. Non-financial conflicts—such as personal relationships, institutional affiliations, or ideological beliefs—should also be declared. If no conflicts exist, a statement to that effect must be included in the manuscript.

Validation of the Bisaya translation of the Insulin Treatment Appraisal Scale (ITAS) and association between Psychological Insulin Resistance (PIR) and glycemic control among patients with type 2 Diabetes mellitus in a private clinic in Surigao City

Dysserie Krystal Palermo-Rivera, RN, MD, DPCP[1,2] and Jose Carlo E. Ongchangco, MD, MHA[2]

Abstract

Introduction The study aimed to validate the Bisaya translation of the Insulin Treatment Appraisal Scale (ITAS), which measures Psychological Insulin Resistance (PIR), and to investigate the association between PIR and glycemic control as measured by the HbA1c among persons with type 2 diabetes mellitus (T2DM) at a private clinic in Surigao City.

Methods Phase 1 involved linguistic validation of the ITAS. Fifty insulin-naive and fifty insulin-using patients with T2DM participated. Phase 2 utilized a cross-sectional study design involving 390 participants who answered the validated Bisaya translation and submitted demographic and clinical data.

Results For Phase 1, results showed good validity and reliability of the Bisaya translation (Cronbach's alpha 0.95). For Phase 2, the median age was 59 years old and the median HbA1c was 8.8 % with only 2.31% having controlled T2DM. The association between PIR and glycemic control was found to be statistically significant (adjusted OR 0.07, 95% CI 0.01 – 0.73, p-value = 0.026).

Conclusion The Bisaya translation of the ITAS had good validity and reliability. There was a statistically significant association between PIR and glycemic control. The high prevalence of uncontrolled diabetes and PIR in the study population underscores the need for better diabetes management in Surigao City.

Key words: Insulin Treatment Appraisal Scale (ITAS), glycemic control, type 2 diabetes mellitus

There is an increasing trend in the prevalence of diabetes worldwide (Hossain 2024). Diabetes mellitus (DM), if uncontrolled, is the leading cause of kidney failure, non-traumatic lower-limb amputations, and adult-onset blindness. Insulin therapy remains the cornerstone of DM management, yet many patients are reluctant to begin taking insulin due to numerous psychological reasons: distress regarding injection, fear of side effects such as hypoglycemia, poor self-efficacy about the skills needed to administer insulin, anxiety over interference with daily living, anticipated social stigma, and misconceptions about the rationale and efficacy of insulin therapy (Cernea 2020, Luk 2016). This phenomenon in literature is known as psychological insulin resistance (PIR).

Correspondence: Dysserie Krystal Palermo-Rivera, RN, MD, DPCP
email Address: riveradp.fam@isdfi.edu.ph
[1]University of the East Ramon Magsaysay Memorial Medical Center, Inc., (UERMMMC) Graduate School
[2]Institute for Studies on Diabetes Foundation, Inc. (ISDFI)

Studies have shown associations between the different aspects of PIR and health outcomes. In their systematic review, Fu et al. (2009) found a negative relationship between fear of injection and treatment outcomes, including a higher HbA1c level. Song et al. (2019) discovered that participants with type 2 DM (T2DM) who refused insulin had higher HbA1c results compared to those who accepted insulin treatment. Other studies in Asia reflected similar findings (Ku et al., 2020; Lee, 2015; Tan et al., 2015). Some participants believed that being prescribed insulin meant that their diabetes had worsened (Lee, 2015).

Based on observations of healthcare providers at a private clinic in Surigao City, one of the factors that contributed to resistance to starting insulin therapy was the patient's lack of accurate knowledge or proper understanding of diabetes and insulin treatment. Some patients believed that insulin was appropriate only for those with severe diabetes. They refused insulin outright, bargained with their healthcare providers to delay starting insulin, or even dropped out of treatment altogether. Oftentimes, this led to chronic hyperglycemia, raising the risk of long-term complications. The dialect spoken in Surigao City is Bisaya, making it essential to use a research instrument that the local population could readily understand. Adapting and testing instruments across different international contexts serve to enhance validity and reliability, permit comparison between cultures, and determine pertinent factors for formulating effective interventions (Cruchinho et al 2024).

Consequently, this study aimed to determine the prevalence of PIR among patients with T2DM seen at a private clinic in Surigao City using the Bisaya translation of the Insulin Treatment Appraisal Scale (ITAS), which is the most widely used questionnaire for measuring PIR, and investigate its association with glycemic control as measured by the HbA1c (Hendrieckx et al 2021).

Methods

After the study received approval from the UERM Ethics Review Committee, the study employed a cross-sectional study design. Measurement of PIR employed the Insulin Treatment Appraisal Scale (ITAS) developed by Snoek et al. (2007). The questionnaire, which may be used on insulin-naive and insulin-using patients, contains 16 negative and 4 positive statements that ask about a patient's view of insulin treatment. Each statement is ranked on a 5-point Likert scale. For non-insulin-using respondents, the ITAS evaluates expectations about future insulin use. The higher the ITAS score, the less willing the respondent is to begin insulin therapy should it be recommended. Since there exists no cut-off score to distinguish whether a patient has PIR or not, the authors recommended the use of other scoring systems for this study. They adapted the scoring system of El Shafei et al. (2015), which had a maximum score of 30. They divided the twenty items into 4 areas: psychosocial concerns, perceived advantages of insulin, fear of injection, and fear of insulin side effects. Scores of 10 or less meant the absence of PIR, while scores more than 10 meant that the patient had PIR.

Measurement of glycemic control involved the collection of HbA1c levels performed within the past three months. The study included only HbA1c tests and results taken at the private clinic in order to address information bias. If there was no available HbA1c result, then the participant underwent the test at the private clinic at no cost.

The study was conducted in a private multi-specialty clinic in Surigao City, established to provide healthcare services to residents of the city and nearby islands. The clinic has diagnostic facilities and attends to an estimated 200–300 patients per day.

The study covered two phases. Phase 1 involved the validation of the Bisaya translation of the ITAS. For the sample size, Gorsuch (1983) and Kline (1994) recommended a minimum of 100 for factor analysis. For the sample size in Phase 2, data were taken from the study of Nur et al. (2011). The proportion of patients who refused insulin treatment and had controlled diabetes mellitus was 0.429, while the proportion of patients who were willing to initiate insulin treatment and had controlled diabetes mellitus was 0.571. Using power computation for two proportions, a level of significance of 5%, a power of 80%, and Stata statistical software, the computed minimal sample size was 388.

The original English version was translated into Bisaya at the University of San Carlos, Cebuano Studies Center then back-translated to English by an endocrinologist fluent in both languages. Pilot testing involved ten patients with T2DM from the private clinic to assess face validity. Afterward, fifty insulin-naive and fifty insulin-using patients with T2DM were recruited through quota sampling; all completed the Bisaya translation. Construct validity was tested using item-total correlations. Known groups validity was

assessed by comparing scores between insulin-naive and insulin-using participants. Internal consistency was also measured.

Phase 2 included patients with T2DM who required insulin regardless of their glucose-lowering regimen were recruited. The basis for this were the ADA recommendations of 1) evidence of ongoing catabolism, 2) with symptoms of hyperglycemia, 3) HbA1c > 10%, and 4) FBS ≥ 300 mg/dL. Patients with type 1 DM, pregnant patients, and patients already on insulin were excluded.

Participants entered the study through consecutive sampling as they came in for outpatient consultation at the private clinic. All participants consented and demographic and clinical data were obtained. They then answered the Bisaya translation of the ITAS.

For Phase 1, the Kolmogorov-Smirnov test was performed to assess for normality of distribution of quantitative data. Testing of construct validity using item-total correlations was performed using Spearman's correlation. Known groups validity was evaluated by comparing the ITAS scores between the insulin-naïve group and the insulin-using group using the Mann-Whitney test. For internal consistency, calculation of Cronbach's alpha and sensitivity testing were performed.

For Phase 2, categorical data were summarized using counts and percentages, Normality for distribution was assessed using the Kolmogorov-Smirnov test. Quantitative data were summarized using medians and interquartile ranges. To compare demographic and clinical characteristic between participants with PIR and those without PIR, the chi-square test of independence was used for categorical variables and the Mann-Whitney test was used for quantitative variables. The chi-square test of association and computation of the prevalence ratio were used to investigate for an association between PIR and glycemic control. For control of confounding, multiple logistic regression was done. Statistical significance was determined at p-values less than 0.05. All statistical analysis was done using Stata statistical software.

Results

Phase 1

During pilot-testing, the ten respondents reported that the questions were clear and easy to understand with no redundant questions. From June to July 2024, 100 participants with T2DM (50 who were insulin-naive and 50 who were insulin-using) took the Bisaya translation of the ITAS. Table 1 summarizes the results of the correlation analysis and sensitivity testing for Cronbach's alpha.

Correlation coefficients for item-total correlations ranged from 0.19 to 0.90, with two items having negative correlation coefficients ("Insulin causes weight gain" and "Taking insulin makes me more dependent on my doctor"). All correlations were statistically significant (p-value < 0.001) except for one item ("Taking insulin increases the risk of low blood glucose levels or hypoglycemia," p-value 0.054). Very strong item-total correlations (correlation coefficient > 0.8) were found for ITAS items 4, 6, 13, 14, 15, and 16, questions that relate to the fear of injection and psychosocial concerns.

For known groups validity, the median ITAS score for the insulin-naive group was 16 (IQR 12.0 to 20.0), while the median score for the insulin-using group was -13.5 (IQR -20.0 to -9.0) (p-value < 0.001). The Cronbach's alpha of the Bisaya translation was 0.95, and sensitivity analysis showed no significant increase in this value upon removal of any individual ITAS item.

Phase 2

A total of 390 patients with T2DM participated in the study. Data collection was conducted from August to December 2024. Table 2 presents the demographic characteristics, while Table 3 outlines the clinical characteristics.

The median age of the Phase 2 participants was 59 years old (IQR 50 – 67 years), with the largest proportion (32.31%) being in the 61-to-70-year-old-bracket. Two-thirds were female and 75.38% were married. Majority (73.59%) were high school level or graduates. Among those with PIR, majority were females (73.56%), while among those without PIR, majority were males (70.49%). Approximately three-fourths of those with PIR and those without PIR were married. Most of those with PIR (82.98%) were high school level or graduates, while most of those without PIR (75.41%) were college level or graduates. Significant statistical differences were found in sex and educational level between the two study groups.

Table 1. Item-total correlations and sensitivity testing of Cronbach's alpha for internal consistency.

ITAS Item	Question	Correlation Coefficient	p-value	Cronbach's Alpha if Item is Removed
1	Taking insulin means I have failed to manage my diabetes with diet and tablets.	0.44	< 0.001	0.9531
2	Taking insulin means my diabetes has become much worse.	0.65	< 0.001	0.9511
3	Taking insulin helps to prevent complications of diabetes.	0.68	< 0.001	0.9500
4	Taking insulin means other people see me as a sicker person.	0.86	< 0.001	0.9464
5	Taking insulin makes life less flexible.	0.75	< 0.001	0.9491
6	I'm afraid of injecting myself with a needle.	0.90	< 0.001	0.9462
7	Taking insulin increases the risk of low blood glucose levels (hypoglycemia).	0.19	0.054	0.9551
8	Taking insulin helps to improve my health.	0.76	< 0.001	0.9485
9	Insulin causes weight gain.	-0.24	0.014	0.9538
10	Managing insulin injections takes a lot of time and energy.	0.78	< 0.001	0.9485
11	Taking insulin means I have to give up activities I enjoy.	0.76	< 0.001	0.9493
12	Taking insulin means my health will deteriorate.	0.78	< 0.001	0.9484
13	Injecting insulin is embarrassing.	0.87	< 0.001	0.9458
14	Injecting insulin is painful.	0.90	< 0.001	0.9454
15	It is difficult to inject the right amount of insulin correctly at the right time every day.	0.89	< 0.001	0.9455
16	Taking insulin makes it more difficult to fulfill my responsibilities (at work, at home).	0.83	< 0.001	0.9464
17	Taking insulin helps to maintain good control of blood glucose.	0.73	< 0.001	0.9492
18	Being on insulin causes family and friends to be more concerned about me.	0.59	< 0.001	0.9511
19	Taking insulin helps to improve my energy level.	0.78	< 0.001	0.9475
20	Taking insulin makes me more dependent on my doctor.	-0.55	< 0.001	0.9503

Table 2. Demographic profile of study participants stratified into presence or absence of psychological insulin resistance.

Characteristic	Total		(+) PIR		(-) PIR		p-value
	Count	%	Count	%	Count	%	
Age (median with IQR)	59 (IQR 50-67)		60 (IQR 51-67)		59 (IQR 46-69)		0.87
18 – 30	8	2.05	5	1.52	3	4.92	
31 – 40	25	6.41	20	6.08	5	8.20	
41 – 50	65	16.67	55	16.72	10	16.39	
51 – 60	114	29.23	98	29.79	16	26.23	
61 – 70	126	32.31	112	34.04	14	22.95	
70 and above	52	13.33	39	11.85	13	21.31	
Sex							< 0.001
Male	130	33.33	87	26.44	43	70.49	
Female	260	66.67	242	73.56	18	29.51	
Marital Status							0.10
Single	14	3.59	6	1.82	8	13.11	
Married	294	75.38	249	75.68	45	73.77	
Separated	6	1.54	5	1.52	1	1.64	
Widowed	67	17.18	60	18.24	7	11.48	
Common Law	9	2.31	6	1.82	3	4.92	
Educational Level							< 0.001
Elementary Level or Graduate	6	1.54	6	1.82	0	0	
High School Level or Graduate	287	73.59	273	82.98	14	22.95	
College Level or Graduate	95	24.36	49	14.89	46	75.41	
Master's Degree (CAR) or Graduate	2	0.51	1	0.30	1	1.64	

Table 3. Clinical profile of study participants stratified into presence or absence of psychological insulin resistance.

Characteristic	Total		(+) PIR		(-) PIR		p-value
	Count	%	Count	%	Count	%	
Presence of Complications Related to Diabetes Mellitus							0.73
None	17	4.36	13	3.95	4	6.56	
Microvascular							
Neuropathy	338	86.67	285	86.63	53	86.89	
Nephropathy	54	13.85	48	14.59	6	9.84	
Retinopathy	178	45.64	155	47.11	23	37.70	
Macrovascular							
Cardiovascular	53	13.59	50	15.20	3	4.92	
Cerebrovascular	22	5.64	22	6.69	0	0	
Peripheral Arterial Disease	81	20.77	70	21.28	11	18.03	
Others	0	0	0	0	0	0	
Duration of Diabetes Mellitus (median with IQR)	4 (IQR-3-6)		4 (IQR 3-6)		5 (IQR 2.5-7.5)		0.34
HbA1c (median with IQR)	8.8 (IQR -10)		8.9 (IQR 8.1-10)		8 (IQR 7.5-9.4)		< 0.001
Controlled	9	2.31	1	0.30	8	13.11	
Uncontrolled	381	97.69	328	99.70	53	86.89	

A high proportion (95.64%) already had complications related to diabetes, with the most common being neuropathy (86.67% of all participants) and retinopathy (45.64% of all participants). The most common macrovascular complication was peripheral arterial occlusive disease (20.77% of all participants). Almost all (97.95%) fulfilled the criteria for treatment intensification. There were 53 participants (13.59% of all participants) who were newly diagnosed with type 2 diabetes mellitus. The median duration of diabetes mellitus was 4 years (IQR 3 to 6 years). The median HbA1c was 8.8 % (IQR 8 to 10), which is classified as uncontrolled.

ITAS scores among those with PIR were higher compared to the scores of participants without PIR. They also had less spread in the middle 50% of the data and a narrower range.

The prevalence of uncontrolled T2DM among the study participants was 97.69%, while the prevalence of PIR was 84.36%. The prevalence ratio is 1.15 (95% confidence interval 1.04 – 1.27). There was a statistically significant association between PIR and

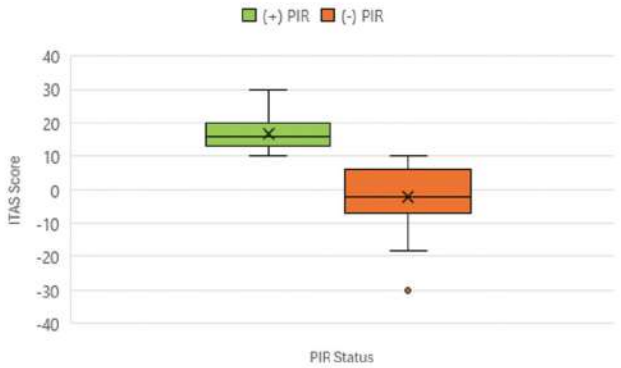

Figure 1. Illustrates a comparison of ITAS scores between participants with PIR and without PIR.

Table 4. Contingency table of PIR and glycemic control.

PIR	Glycemic Control		TOTAL
	Uncontrolled	Controlled	
(+)	328	1	329
(-)	53	8	61
TOTAL	381	9	390

glycemic control (crude OR 0.02, 95% confidence interval 0 – 0.16, p-value < 0.001), even while controlling for demographic characteristics such as age, sex, educational attainment, and marital status and clinical characteristics such as presence of complications related to T2DM and duration of T2DM (adjusted OR 0.07, 95% confidence interval 0.01 – 0.73, p-value = 0.026).

Discussion

Phase 1

Based on pilot-testing, the Bisaya translation of the ITAS was easy to understand with no redundant questions. Very strong item-total correlations were found for 6 items related to the fear of injection and psychosocial concerns. Scores between insulin-naive and insulin-using groups showed a statistically significant difference. The Cronbach's alpha was 0.95, which translates to excellent internal consistency, with no significant changes during sensitivity analysis, meaning that all questionnaire items contributed equally in measuring the construct of PIR.

Comparison with the original English ITAS showed a very similar level of internal consistency. The original reported a Cronbach's alpha of 0.89. This indicates that, in both versions of the questionnaire, the items relate well to the underlying construct of PIR.

Item-total correlations revealed very strong positive associations in four ITAS items relating to the fear of injection, which implies a general fear of needles among the Filipino population contributing to PIR. local study among young adults reported a 34% prevalence of hypodermic needle fear in the study population (Camua et al 2021). Factors affecting this fear included witnessing the needle penetrating someone else's skin, medical staff who lacked competence to handle the needle, and veins that were difficult to access. A similar study among aged 18 to 65 years old cited the fear of needles and blood as a hindrance to individuals voluntarily donating blood (Mappala et al 2023) Another local study echoed this same observation, with 28.95% of study participants having a fear of needles, which contributed to a low rate of blood donation (Sarong 2023).

The Bisaya translation of the ITAS bears significant clinical significance, as it can measure PIR among Bisaya-speaking populations. It can assist the physician in identifying patients with T2DM who are hesitant to initiate insulin therapy and consequently take steps to address such reluctance. Repeat administration of the Bisaya translation can also monitor PIR trends in individual patients.

Phase 2

The median age of the study participants was 59 years old (IQR 50 – 67 years old), with the largest proportion (32.31%) being in the 61-to-70-year-old-bracket. Among those with PIR (n = 329), almost three-fourths were female and married. Almost all study participants (95.64%) had complications related to diabetes, with the most common being neuropathy (86.67%) and retinopathy (45.64%). The median duration of DM was 4 years (IQR 3 to 6 years). The median HbA1c was 8.8 % (IQR 8 to 10), which is classified as uncontrolled.

The prevalence of PIR among the study population was 84.36%. The median ITAS score of the study participants was 15 (IQR 11 – 19). ITAS scores were higher among study participants with PIR compared to study participants without PIR. Almost all study participants had uncontrolled diabetes. Only 2.31% had controlled T2DM as evidenced by an HbA1c result of 7% or less.

Based on the prevalence ratio, study participants with PIR were 1.15 times more likely to have uncontrolled diabetes compared to study participants without PIR. The association between PIR and glycemic control was found to be statistically significant (p-value < 0.001). The crude odds ratio was 0.02 (95% CI 0 – 0.16), which shows a strong negative association. After controlling for confounding variables using multivariate logistic regression analysis, the association between PIR and glycemic control remained strongly negative (adjusted OR 0.07, 95% confidence interval 0.01 – 0.73, p-value = 0.026).

The study participants were generally on the more elderly side. The median duration of diabetes was 4 years. This implies that most of these patients were diagnosed late, and it may explain why almost all were found to have complications related to diabetes, consistent with the study of Dulyapach et al. (2022) confirming that early diagnosis of T2DM decreased the risk for DM-related complications. Porta et al.

(2014) also found that if retinopathy was already present, the estimated time from the onset of type 2 diabetes to actual diagnosis was 6.05 years. This may also account for the generally poor control as evidenced by a median HbA1c of 8.8%.

Majority of those with PIR were females and married. This may be because of the tendency to place the needs of the family first before the self, which is a trait of Filipinos as seen in the studies of Jiolito (2022) and Licuanan (1994) This was also consistent with the study of Wong et al. (2010), wherein females had a higher prevalence of PIR.

Majority (82.98%) of participants (with PIR reached secondary school level. Educational attainment had an influence on the high level of PIR in the study population. The study by Lee (2015) among Chinese participants in Hong Kong found a negative association between PIR and education level. The cross-sectional study of Wong et al. (2010) found that participants with a tertiary level of education were 3.3 more likely to be willing to use insulin compared to participants who did not reach a tertiary level of education (95% CI 1.8 – 6.1), and this is consistent with study findings wherein three-fourths of participants without PIR reached college level. The findings from of Lee (2015) and Wong et al. (2010) were also echoed by the research of El Shafei et al. (2015).

Similar to the present study, Lee (2015) also used the ITAS to measure PIR. The most frequently reported barriers to insulin initiation corresponded to ITAS items 6 ('I am afraid of injecting myself with a needle'), 15 ('It is difficult to inject the right amount of insulin correctly at the right time every day'), and 5 ('Taking insulin makes life less flexible'). In the current study, there were similarities in terms of ITAS item 6 and 15 with regards to being common barriers to insulin use, but ITAS item 5 was actually the item with the second lowest score among the Bisaya population in the study. Perhaps it is because that the Filipino is known to be flexible, with a great capability to adjust and adapt to various circumstances.(Licuanan 1994). In his paper examining the ambivalence theory of Filipino values and norms, Jiolito (2022) noted that the flexibility, adaptability, and creativity described by Licuanan stand in contrast to Filipinos' limited engagement in self-analysis and reflection. Furthermore, this flexibility and adaptability are reflected—both positively and negatively—in the well-known phrase 'bahala na,' a coping mechanism that other nationalities have sometimes viewed as fatalistic (Gallimore, 2023).

Findings about PIR and the relationship with the HbA1c in the current study were similar with the systematic review of Fu et al. (2009)., The authors found a negative correlation between fear of insulin with treatment outcomes. Two studies were specific with the use of the HbA1c as the treatment outcome: Mollem et al. (1996) saw that participants with higher survey scores for measuring barriers in diabetes such as the fear of insulin injection had more elevated HbA1c results, while Zambanini et al. (1999) found that the mean HbA1c result was larger among those with higher injection anxiety scores.

A study by Fu et al. (2015) on Chinese patients from Hong Kong also found that participants with lower HbA1c results had more barriers to starting insulin therapy.

The participants revealed a general ambivalence to initiating insulin therapy.

Conclusion

The Bisaya translation of the ITAS had good validity and reliability. Based on the ITAS, PIR in the study population was high. Almost all participants had uncontrolled diabetes mellitus, particularly in the group with PIR. There was a statistically significant association between PIR and glycemic control even while controlling for confounding variables.

The high prevalence of uncontrolled diabetes, diabetes-related complications, and PIR in the study population serves as a wake-up call and underscores the need for better diabetes management in Surigao City. Efforts to educate patients with DM about these may be useful in attaining better blood glucose levels and consequently, improved health outcomes.

The results of this study emphasize how important it is to understand and address patients' view and opinions about their diabetes and to foster a supportive environment to facilitate the initiation of insulin therapy. Furthermore, it may be in the best interest of the healthcare providers to improve measures for patient education, health teaching, and to enlist the aid of patients without PIR in lessening the psychologic hesitancy to initiate insulin therapy.

Limitations of the Study

Limitations of the study include its cross-sectional design, which precludes any inference of causality between variables. Caution is also warranted when

generalizing the findings to populations outside the study sample—such as patients with type 1 diabetes, inpatients, individuals in urban settings or with ready access to tertiary hospitals, and patients with well-controlled diabetes—as the majority of participants in this study had elevated HbA1c levels. Moreover, the study did not examine the impact of any clinic-based interventions aimed at improving diabetes outcomes.

Recommendations

For patients with diabetes mellitus in Siargao or other provinces in the Philippines where Bisaya is spoken, it is recommended to use the Bisaya translation of the ITAS to measure the individual patient's psychological insulin resistance, as this has an influence on willingness to initiate insulin therapy and on glycemic control. Repeated measurement may be useful in identifying trends in the patient's PIR, which can reflect the effectiveness of interventions formulated to address this reluctance. Furthermore, identification of specific aspects of PIR, whether it be fear of injections or a worry that insulin will affect activities of daily living, can help tailor the intervention to each patient.

To the best of the primary investigator's knowledge, this is the first study conducted in a rural Philippine setting to examine psychological insulin resistance and its association with glycemic control. Future research may explore local religious and cultural beliefs that contribute to PIR; undertake experimental studies to assess the effectiveness of interventions designed to reduce PIR; or evaluate the applicability of the translated ITAS in other Filipino populations that speak Bisaya. Further studies may also focus on validating ITAS translations in other major Philippine dialects, particularly in regions with high rates of PIR.

Acknowledgements

The first author wishes to thank her husband, Dr. Marcel L. Rivera, for helping her choose this research topic for her masteral thesis; her parents for all the support; the faculty of the ISDFI, especially Dr. Grace de los Santos and Dr. Josefina Florendo for their valuable guidance during the thesis process; Dr. Marivic Villamor for her encouragement and contribution to the first author's academic experience; Leyden Florido for her insightful advice and fresh perspectives; and Professor Frank Snoek, who permitted the use and linguistic validation of the ITAS.

Support/Funding

This study was the masteral thesis of the first author in the Master of Science in Internal Medicine, Major in Diabetology program at the University of the East Ramon Magsaysay Medical Center, Inc. Funding for this study came solely from the authors. There were no sponsors.

Conflict of Interest

The authors declare no conflict of interest.

References

Camua EMG, Buluran PMD, Lopez XAB, Cabalonga AM, Antonio EJP & David PP. Factors influencing the fear of hypodermic needles among young adults in Bulacan. Global Sci J 2021; 9(7): 757–63. https://www.globalscientificjournal.com/researchpaper/Factors_Influencing_the_Fear_of_Hypodermic_Needles_Among_Young_Adults_in_Bulacan.pdf

Cernea S & Raz I. Insulin therapy: Future perspectives. Am J Ther 2020; 27(1): e121–e32. https://doi.org/10.1097/MJT.0000000000001076

Cruchinho P, López-Franco MD, Capelas ML, Almeida S, Bennett PM, da Silva MM, Teixeira G, Nunes E, Lucas P, Gaspar F & Handvers 4 Safe Care. Translation, cross-cultural adaptation, and validation of measurement instruments: A practical guideline for novice researchers. J Multidisc Healthcare 2024; 17: 2701–28. https://doi.org/10.2147/JMDH.S419714

Dulyapach K, Ngamchaliew P, Vichitkunakorn P, Sornsenee P & Choomalee K. Prevalence and associated factors of delayed diagnosis of type 2 diabetes mellitus in a tertiary hospital: A retrospective cohort study. Int J Public Health 2022; 67, Article 1605039. https://doi.org/10.3389/ijph.2022.1605039

El Shafei MM, Sayahh HES & Hussein R. Psychological insulin resistance in patients with type 2 diabetes mellitus. Egyptian J Psychiat 2015; 36(1): 60–5. https://doi.org/10.4103/1110-1105.153794

Fu AZ, Qiu Y & Radican L. Impact of fear of insulin or fear of injection on treatment outcomes of patients with diabetes. Current Medical Research and Opinion 2009; 25(6): 1413–20. https://doi.org/10.1185/03007990902905724

Fu SN, Wong CKH, Chin WY & Luk W. Association of more negative attitude towards commencing insulin with lower glycosylated hemoglobin (HbA1c) level: A survey on insulin-naïve type 2 diabetes mellitus Chinese patients. J Diab Metab Disord 2015; 15, Article 223. https://doi.org/10.1186/s40200-016-0223-0

Gallimore D. (2023). Understanding Filipino traits, values, and culture. Outsource Accelerator.https://www.outsourceaccelerator.com/articles/filipino-traits-and-values/

Gorsuch R. (1983). Factor Analysis (2nd ed., p. 332). Erlbaum Associates.

Hendrieckx C, Halliday JA, Beeney LJ, Speight J & Bennet A. (2021). Diabetes and emotional health: A practice guide for health professionals supporting adults with Type 1 and Type 2 diabetes (3rd ed., p. 79). American Diabetes Association. https://professional.diabetes.org/sites/default/files/media/ada_mental_health_workbook_chapter_5.pdf

Hossain MJ, Al-Mamun M & Islam MR. Diabetes mellitus, the fastest growing global public health concern: Early detection should be focused. Health Sci Rep 2024; 7(3): e2004. https://doi.org/10.1002/hsr2.2004

Jiolito BL. In defense of Filipino values and norms: Debunking the ambivalence theory. HCMCOU J Soc Sci 2022; 12(1): 130–43. https://doi.org/10.46223/HCMCOUJS.soci.en.12.1.2215.2022

Kline P. (1994). An easy guide to factor analysis (p. 40). Routledge.

Ku EJ, Lee DH, Jeon HJ, Park F & Oh TK. Psychometric analysis regarding the barriers to providing effective insulin treatment in type 2 diabetic patients. Diab Ther 2020; 12(1): 159–70. https://doi.org/10.1007/s13300-020-00947-2

Lee KP. Psychosocial factors associated with psychological insulin resistance in primary care patients in Hong Kong. J Clin Transl Endocrinol 2015; 2(4): 157–62. https://doi.org/10.1016/j.jcte.2015.10.001

Licuanan P. A moral recovery program: Building a people – building a nation. In MB Dy (Ed.): Values in Philippine Culture and Education 1994; 35–54. The Council for Research in Values and Philosophy.

Luk A. Psychological insulin resistance: Scope of the problem. Hong Kong Med J 2016; 22(4): 304–5. https://doi.org/10.12809/hkmj165025

Mappala ACA, Alican CAL, Dulay DCT, Mancita SCA, Utanes BYG & Clemente BM. Factors affecting voluntary blood donations among adults in Metro Manila, Philippines, as a basis for policy improvement on donor recruitment. Acta Medica Philippina 2023; 57(5): 73–81. https://doi.org/10.47895/amp.vi0.4351

Mollem E, Snoek F & Heine R. Assessment of perceived barriers in self-care of insulin requiring diabetic patients. Patient Education and Counseling 1996; 29(3): 277–81. https://doi.org/10.1016/S0738-3991(96)00926-3

Porta M, Curletto G, Cipullo D, de la Longrais RR, Trento M, Passera P, Taulaigo AV, Di Miceli S, Cenci A, Dalmasso P & Cavallo F. Estimating the delay between onset and diagnosis of type 2 diabetes from the time course of retinopathy prevalence. Diabetes Care 2014; 37(6): 1668–74. https://doi.org/10.2337/dc13-2101

Sarong KG. Community-based blood donation program: Sustainability and local capacity building in these changing times of demand in the global health. Silliman J 2023; 64(1): 83–105. https://sillimanjournal.su.edu.ph/index.php/sj/article/view/381

Snoek FJ, Skovlund SE & Pouwer F. Development and validation of the Insulin Treatment Appraisal Scale (ITAS) in patients with type 2 diabetes. Health and Quality of Life Outcomes 2007; 5, Article 69. https://doi.org/10.1186/1477-7525-5-69

Song Y, Ku BJ, Cho J, Jun Y, Kim B & Nam S. The prevalence of insulin refusal and psychological insulin resistance among Korean patients with type 2 diabetes mellitus. Ann Translat Med 2019; 7(23): 760. https://doi.org/10.21037/atm.2019.11.77

Tan WL, Asahar SF & Harun NL. Insulin therapy refusal among type II diabetes mellitus patients in Kubang Pasu district, Kedah, Malaysia. Singapore Med J 2015; 56(4): 224–7. https://doi.org/10.11622/smedj.2014170

Wong S, Lee J, Ko Y, Chong MF, Lam CK & Tang WE. Perceptions of insulin therapy amongst Asian patients with diabetes in Singapore. Diab Med 2010; 28(2): 206–11. https://doi.org/10.1111/j.1464-5491.2010.03195.x

Zambanini A, Newson RB, Maisey M & Feher MD. Injection-related anxiety in insulin-treated diabetes. Diab Res Clin Pract 1999; 46(3): 239–46. https://doi.org/10.1016/S0168-8227(99)00099-6

The effect of a neurological training module on the competency of neurocritical care staff nurses

Ruperto A. Asesor Jr., RN, MSN and Leonor V. Fruto, RN, MN

Abstract

Aim This study aimed to determine the effect of the Brain EMERGENT Training Module on the competency of neurocritical care staff nurses (SNs) assigned to the Neurocritical Care Unit (NCCU) and Acute Stroke Unit (ASU) in the management of post-operative neurological patients (PONP) with increased intracranial pressure (IICP).

Methods This quasi-experimental study included 19 SNs recruited through purposive sampling to undergo the Brain EMERGENT training module. Four instruments were developed based on Miller's framework to measure pre- and post-test competencies across four domains: (1) Knowledge (Cronbach's $\alpha = 0.82$), (2) Affective (Cronbach's $\alpha = 0.88$), (3) Psychomotor (Cronbach's $\alpha = 0.84$), and (4) "Does" domain, assessed through skills validation four weeks after training.

Results The training module produced a highly significant improvement in the Knowledge domain (pre-test mean = 7.8, SD = 1.6; post-test mean = 9.7, SD = 1.3; $p = 0.0009$) and a significant improvement in the Affective domain (pre-test mean = 58.8, SD = 7.6; post-test mean = 63.2, SD = 6.6; $p = 0.0228$). There was no significant effect on the Psychomotor domain (pre-test mean = 27.8, SD = 3.1; post-test mean = 28.5, SD = 2.8; $p = 0.0855$). In the "Does" domain, 8 out of 10 SNs met the competency standards during skills validation, while 2 did not.

Conclusion The Brain EMERGENT training module significantly improved competencies in the Knowledge and Affective domains but showed no significant effect on Psychomotor skills.

Key words: Miller framework, Brain EMERGENT training module, neurocritical care, increased intracranial pressure, staff nurse competency

The care of post-operative neurological patients (PONP) requires advanced nursing skills to promptly identify subtle changes that may lead to permanent disability or sudden death (Schimpf, 2012). Although there are currently no formal certifications for "Neuroscience Nurses" in the Philippines, the Critical Care Nurses Association of the Philippines, Inc. (CCNAPI) provides a training program for "Stroke Nurses." However, the neuroassessment competencies of stroke nurses are often suboptimal (Cook et al., 2019). The primary aim of neurocritical care is to detect and prevent neurological deterioration (Pritchard, 2011). Studies have shown that neurological patients have lower mortality and better outcomes when cared for in a specialized Neurocritical Care Unit (NCCU), compared with general critical care units (Kurtz et al., 2011). According to Levett-Jones et al. (2011), competence refers to the process of measuring knowledge, skills, and attitudes according to professional standards, ensuring that practitioners can perform their roles safely and effectively.

The care of PONP is grounded in the Monro–Kellie doctrine, which describes increased intracranial pressure (IICP) as a pathological condition within a

Correspondence: Ruperto A. Asesor Jr., MSN, RN
email address: raasesor@gmail.com
University of the East Ramon Magsaysay Memorial Medical Center (UERM)

rigid, non-compressible cranial vault. The volume of brain tissue, interstitial fluid, intravascular blood, and cerebrospinal fluid (CSF) must remain constant to maintain equilibrium. Several nursing interventions—such as suctioning, coughing, straining, the Valsalva maneuver, fever, pain, anxiety, and hypertension—may contribute to IICP (Hickey, 2014). The Glasgow Coma Scale (GCS), widely used to evaluate neurological responsiveness, has been reported to yield incorrect or inconsistent scoring by nurses (Braine, 2016). Ugras et al. (2015) identified chest physiotherapy, coughing, and tracheal suctioning as activities that increase IICP; thus, these should only be performed when necessary and for the shortest duration possible. Signs of respiratory distress and agitation—such as tachycardia and diaphoresis—require sedation before and after suctioning to prevent IICP (Hickey, 2014). Agitation and acute pain may arise from intracranial hemorrhage or cerebral edema (Zhao, 2017). When undertreated, they increase cerebral oxygen demand and may contribute to ischemia (Zhao, 2017).

A self-administered survey on competencies in traumatic brain injury (TBI) care conducted by Kiewet (2019) among staff nurses (n = 98) across multiple ICUs used Patricia Benner's model (1982) as its framework. Results showed that ICU nurses without NCCU exposure had the lowest knowledge, while those with 1–2 years of NCCU experience had the highest. In the Philippines, a study among Filipino nurses found that permanent employment status, marital status, and years of service were associated with higher competency (Feliciano, 2019). Additional factors contributing to the theory–practice gap include resource limitations, lack of experience, and insufficient collaboration between clinical staff and academic institutions (Salifu et al., 2018).

The goal of the present study was to examine the effect of a training module on four domains of the Miller framework (Figure 1): (1) Knowledge, (2) Psychomotor skills, (3) Affective domain, and (4) the "Does" domain in highly skilled staff nurses (SNs) in neurocritical care.

Methods

This quantitative, quasi-experimental study was conducted in the NCCU and Acute Stroke Unit (ASU) of a 307-bed tertiary university hospital. Purposive sampling was used due to the limited

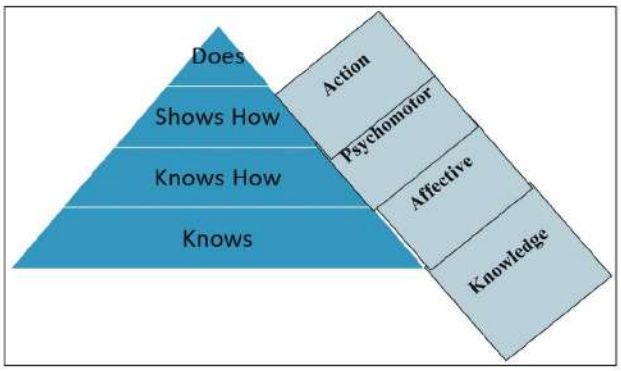

Figure 1. Miller model

number of SNs in the NCCU/ASU across four surveyed tertiary hospitals. All 22 eligible SNs were invited; 19 completed the training module, meeting the minimum sample requirement (Krejcie & Morgan, 1970). Inclusion criteria were: (1) Registered nurses employed for at least three months, (2) completion of hospital orientation, and (3) assignment to the NCCU or ASU.

Five questionnaires were developed based on the Miller framework:

1. **Knowledge Domain** – "Knowledge Level of SNs in the Assessment and Monitoring of PONP with IICP." This 12-item tool assessed neuroanatomy and neurophysiology based on the Monro–Kellie doctrine. Reliability was Cronbach's $\alpha = 0.82$; average CVI = 0.9583.
2. **Affective Domain** – "Perceived Level of Confidence of SNs in the Care of PONP with IICP." This 15-item tool used a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Reliability was Cronbach's $\alpha = 0.88$.
3. **Psychomotor Domain** – "Decision-Making Skills of SNs in Psychomotor Interventions." This 33-item tool had a Cronbach's $\alpha = 0.84$ and average CVI = 0.9393, indicating excellent content validity.
4. **'Does' Domain** – "Validation of SNs' Skills Learned in the Brain EMERGENT Training Module." This 28-item checklist evaluated direct observation and face-to-face assessments; it was piloted in another hospital.

Questionnaires 1 and 3 were developed from literature and guidelines of the Neurocritical Care

Society (Malaiyandi & Shutter, 2017). The Goldilocks method (Zieky, 1994) was used, with a minimum passing level (MPL) of 80%.

Data were analyzed using descriptive statistics, Wilcoxon tests, and ANOVA using Stata 10. Statistical significance was set at $p < 0.05$.

The "Brain EMERGENT" training module consisted of a 4-hour interactive lecture with video presentations in the morning and a 2-hour workshop with OSCE return demonstrations in the afternoon. Each participant received a coded identifier for confidentiality. Sessions accommodated a maximum of six SNs per batch. Post-tests were administered after two weeks; the "Does" domain was evaluated after four weeks.

Results

The study included 9 men and 10 women; most were single (n = 16). Sixteen participants had more than one to five years of work experience, and three had one year of experience. Demographic variables were not significantly associated with post-test outcomes.

Knowledge Domain

Significant improvements were observed in Anatomy and Physiology of the Brain ($p = 0.0299$) and Blood ($p = 0.0053$), but not in CSF ($p = 0.0815$). Seven participants scored zero in CPP and MAP computations. The overall post-test mean (9.7 ± 1.3) was significantly higher than the pre-test mean (7.8 ± 1.6), $p = 0.0009$ (Table 1).

Affective Domain

Significant improvements were noted in:

- assessing family needs ($p = 0.0111$),
- ability to teach neurovascular assessments ($p = 0.0452$),
- resilience despite heavy workload ($p = 0.0023$), and
- willingness to assume administrative tasks ($p = 0.0299$).

The overall post-test mean (63.2 ± 6.6) was significantly higher than the pre-test mean (58.8 ± 7.6), $p = 0.0228$ (Table 2).

Psychomotor Domain

Most participants were already competent (100% correct) at pre-test in oxygenation, target temperature management (TTM), positioning, and patient/family education. Lower competency was observed in IICP assessment and prevention, medication management, and complication prevention. The training did not significantly improve the overall psychomotor domain ($p = 0.0855$) except for neurological assessment skills ($p = 0.0352$) (Table 3).

'Does' Domain

Ten participants underwent bedside validation four weeks after training. All demonstrated competence in GCS scoring, IICP intervention, oxygenation, CO_2 elimination, and medication administration. Only 3/10 computed MAP correctly. Eight out of ten identified early signs of IICP and strategies to promote CO_2 elimination. In total, 22 out of 28 action-based skills were performed competently by at least eight participants.

Discussion

Anatomy and physiology scores did not significantly improve in the CSF domain ($p = 0.0815$). Seven SNs

Table 1. Comparison of affective competency scores between pre-test and post-test

Subdomains of Cognitive Competency	Pre-test Mean SD	Post-test Mean SD	p-value[‡]
Anatomy and Physiology of the Brain	5.7, 0.9	6.2, 0.8	**0.0299**
Anatomy and Physiology of Blood in the Brain	1.2, 1.1	2.2, 0.8	**0.0053**
Anatomy and Physiology of CSF	0.9, 0.6	1.3, 0.7	0.0815
Overall Knowledge	**7.8, 1.6**	**9.7, 1.3**	**0.0009**

[‡]Wilcoxon signed-rank test

Table 2. Comparison of affective competency scores between pre-test and post-test.

Subdomains of Affective Competency	Pre-test Mean SD	Post-test Mean SD	p-value‡
Q1 Confidence in recognizing subtle changes in BP	3.8, 0.8	4.3, 0.6	0.0938
Q2 Recognize need for assistance and seek consult	4.0, 0.7	4.3, 0.6	0.1182
Q3 Able to do assessments despite of increased workload	4.1, 0.6	4.2, 0.5	0.4397
Q4 Assessing the needs of the family	3.7, 0.7	4.3, 0.6	**0.0111**
Q5 Consider patient's and family's knowledge base	3.9, 0.7	4.3, 0.5	0.1238
Q6 Ability to teach neurovascular assessments to others	3.7, 0.8	4.3, 0.7	**0.0452**
Q7 Provide optimal nursing care in IICP	4.1, 0.7	4.3, 0.6	0.2389
Q8 Able to do a good job	3.9, 0.8	4.1, 0.7	0.2568
Q9 Understand the role of the SN's with regards to the care of patients with IICP	4.1, 0.8	4.3, 0.7	0.3617
Q10 Challenges in the care of complex neurological cases	4.1, 0.7	4.3, 0.7	0.4397
Q11 Seek opportunities to gain specialized neuro-training	4.5, 0.7	4.4, 0.5	0.7055
Q12 Not affected by too many workloads	3.1, 0.8	3.8, 0.9	**0.0023**
Q13 Take advantage of attending educational programs.	4.2, 0.9	4.2, 0.8	0.8508
Q14 Looking forward to administrative tasks	3.5, 1.0	4.0, 0.8	**0.0299**
Q15 Use patient educational material/s for communication during assessment/treatment	4.2, 0.9	4.4, 0.5	0.4397
Overall perceived level of confidence	**58.8, 7.6**	**63.2, 6.6**	**0.0228**

‡Wilcoxon signed-rank test

Table 3. Comparison of pre-test and post-test in "Decision-making skills in psychomotor domain".

Subdomains of Psychomotor Competency	Pre-test Mean SD	Post-test Mean SD	p-value‡
Neuro Assessment	7.2, 0.9	7.8, 1.2	**0.0352**
Oxygenation	2.7, 0.5	2.9, 0.2	0.1025
Target Temperature Management	2.1, 0.9	2.3, 0.8	0.4927
Positioning	2.6, 0.5	2.5, 0.6	0.5271
Medication Management	4.9, 0.7	5.3, 0.7	0.2596
Complications	5.9, 0.9	5.8, 1.0	0.8290
Patient/Family Education	1.8, 0.4	1.8, 0.4	1.0000
Overall Decision-making Skills	**27.4, 1.7**	**28.5, 2.8**	**0.0855**

‡Wilcoxon signed-rank test

answered CPP and MAP computations incorrectly. White (2012) noted that anatomy and physiology are challenging areas for nursing students due to complex terminology and concepts.

The Affective domain revealed strengths in patient and family education, consistent with literature identifying caregivers as "secondary patients" who require support (Boyle, 2015; Reinhard, 2008). However, confidence in "being able to do a good job" remained low, possibly due to overwhelming workloads during the COVID-19 pandemic. Heavy nursing workloads have been associated with compromised patient safety (Lang, 2004), and focusing on weaknesses may decrease performance by up to 27% (Hearn, 2017).

The training did not significantly improve the Psychomotor domain aside from neurological assessments ($p = 0.0352$). Limited OSCE time (2 hours) and lack of technological devices such as ICP monitors and external ventricular drains may have hindered skills acquisition. Participants reported forgetting skills when not practiced regularly. Lack of technological resources has been shown to impair skills acquisition and lead to unsafe improvisations (Mwale & Kawala, 2016; Rhodes et al., 2011).

Most SNs adhered to proper positioning (30–45° HOB elevation), turning schedules, and neck alignment techniques. However, gaps remained in pain management, bowel program initiation, and sedation vacation practices—an essential intervention to

improve outcomes and reduce mechanical ventilation duration (Oddo, 2016).

Regular training modules every two years are recommended to identify knowledge gaps and enhance competency (Oyesanya, 2017). Assessment of knowledge and practice before and after training is essential to ensure competence (Lima, 2018). To strengthen psychomotor performance, OSCE time should be increased to 4 hours, with updated technology and repeated practice. The absence of individualized feedback diminishes the effects of repeated practice (Tirado, 2016).

The Brain EMERGENT Bundles of Care Nursing Management (Figure 2) was developed as a standardized algorithm to facilitate timely and appropriate nursing interventions for PONP with IICP. Overall, the training module significantly improved knowledge and affective domains but had limited effect on psychomotor outcomes.

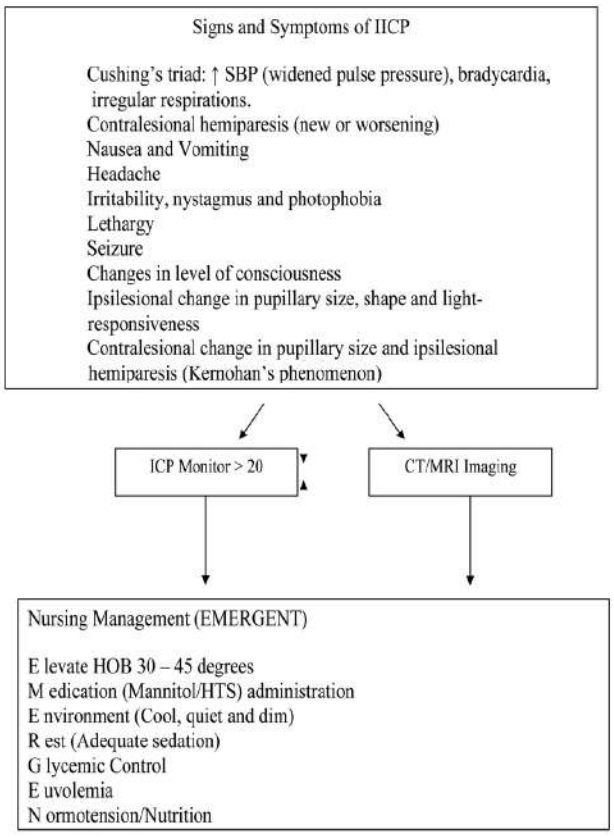

Figure 2. Increased Intracranial Pressure (IICP) for post-operative neurological patient
Brain EMERGENT Bundles of Care Nursing Management (ASESOR, RA, MSN, RN).

Acknowledgement

Gratitude goes to my thesis committee for their unwavering support. I want to thank Dr. Wilhelmina Z. Atos PhD, RN, research panel chair, Milagros B. Rabe, MD, Dean of UERM Graduate School, and Maria Peñafrancia Adversario, MD, for her statistical expertise.

References

American Nurses Association. (2010). Nursing: Scope and standards of practice (2nd ed.).

Assunção Ribeiro KR, Lima ML, De Abreu EP, Gomes VF, Santos JA, Gonçalves, FA, Borges MM & Guimarães NN. Management of intracranial hypertension in patients neurocríticos: Integrative review. Nursing & Care Open Access J 2018; 5(3). https://doi.org/10.15406/ncoaj.2018.05.00131

Boyle B. The critical role of family in patient experience. Patient Exp J 2015; 2(2): 4–6. https://doi.org/10.35680/2372-0247.1112

Braine ME & Cook N. The Glasgow Coma Scale and evidence-informed practice: A critical review of where we are and where we need to be. J Clin Nurs 26(1–2), 280–93. https://doi.org/10.1111/jocn.13390

Cook NF, et al. (2019). Nurses' understanding and experience of applying painful stimuli when assessing components of a Glasgow Coma Scale. J Clin Nurs 2016; 28(21–22): 3827–39. https://doi.org/10.1111/jocn.15011

Feliciano E, Boshra AY, Mejia PC, Feliciano AZ, Maniago JD, Alsharyah HM, Malabanan MC & Osman A. Understanding Philippines nurses' competency in the delivery of healthcare services. J Patient Care 2019; 5(1). https://doi.org/10.35248/2573-4598.19.5.146

Gulay Altun Ugras S & Yuksel S. Factors affecting intracranial pressure and nursing interventions. Jacobs J Nurs Care 2015.

Hearn S. (n.d.). Daftar situs Judi slot online terpercaya 2021. Brand Quarterly.https://www.brandquarterly.com/managers-focus-employee-strengths-inspire-great-performance

Hickey JV. (2014). Intracranial hypertension: Theory and management of increased intracranial pressure. In Neurological and Neurosurgical Nursing (2014 ed.). Lippincott Williams & Wilkins, a Wolters Kluwer business.

Kiewet J. (2019). Professional nurses' knowledge and clinical practice regarding patients with a traumatic brain injury in a tertiary hospital.

Krejcie RV & Morgan DW. (1970). Determining sample size for research activities. Educational and Psychological Measurement.

Kurtz P, Fitts V, Sumer Z, Jalon H, Cooke J, Kvetan V & Mayer SA. How does care differ for neurological patients admitted to a neurocritical care unit versus a general ICU?. Neurocritical Care 2011; 15(3): 477–80. https://doi.org/10.1007/s12028-011-9539-2

Levett-Jones T, Gersbach J, Arthur C & Roche J. Implementing a clinical competency assessment model that promotes critical reflection and ensures nursing graduates' readiness for professional practice. Nurse Educ Pract 2011; 11(1): 64–9. https://doi.org/10.1016/j.nepr.2010.07.004

Malaiyandi D & Shutter L. Elevated intracranial pressure & hydrocephalus. In M Darsie & M Moheet (Eds.): The Pocket Guide to Neurocritical Care 2017; (1st ed., pp. 62–72). Neurocritical Care Society.

Mwale OG & Kalawa R. Factors affecting acquisition of psychomotor clinical skills by student nurses and midwives in CHAM Nursing Colleges in Malawi: A qualitative exploratory study. BMC Nursing 2016; 15(1). https://doi.org/10.1186/s12912-016-0153-7

Oddo M, Crippa IA, Mehta S, Menon D, Payen J, Taccone FS & Citerio G. Optimizing sedation in patients with acute brain injury. Crit Care 2016; 20(1). https://doi.org/10.1186/s13054-016-1294-5

Oyesanya T, Turkstra LS & Bowers BJ. Nurses' concerns about caring for patients with traumatic brain injury. Arch Phys Med Rehab 2016; 97(10): e87–e88. https://doi.org/10.1016/j.apmr.2016.08.269

Pritchard C & Radcliffe J. General principles of postoperative neurosurgical care. Anaesth Intens Care Med 2011; 12(6): 233–9. https://doi.org/10.1016/j.mpaic.2011.03.006

Reinhard SC, Given B, Petlick NH, et al. (2008). Supporting family caregivers in providing care. In R. G. Hughes (Ed.), Patient safety and quality: An evidence-based handbook for nurses. Agency for Healthcare Research and Quality (US).

Rhodes M, Morris A & Lazenby R. (2011). Nursing at its best: Competent and caring. The Online Journal of Issues in Nursing.

Salifu DA, Gross J, Salifu MA & Ninnoni JP. Experiences and perceptions of the theory-practice gap in nursing in a resource-constrained setting: A qualitative descriptive study. Nursing Open 2018; 6(1): 72–83. https://doi.org/10.1002/nop2.188

Schimpf MM. Diagnosing increased intracranial pressure. J Trauma Nurs 2012; 19(3): 160–7. https://doi.org/10.1097/jtn.0b013e318261cfb4

Tirado F. (2016). Retention of cardiopulmonary resuscitation knowledge and psychomotor skill among undergraduate nursing students: An integrative review of literature. https://stars.library.ucf.edu/honorstheses/82

White S & Sykes A. (2012). Evaluation of a blended learning approach used in an anatomy and physiology module for pre-registration health care students. Paper presented at the Fourth International Conference on Mobile, Hybrid, and Online Learning.

Zhao L, Shi Z, Chen G, Yin N, Chen H, Yuan Y, Cao W, Xu M, Hao J & Zhou J. Use of dexmedetomidine for prophylactic analgesia and sedation in patients with delayed extubation after craniotomy: A randomized controlled trial. J Neurosurg Anesthesiol 2017; 29(2): 132–9. https://doi.org/10.1097/ana.0000000000000260

Resilience and burnout among medical students in blended learning: a correlational study

Nicole Anne O. Abonal[1], Lee Carron S. Aganda[1], Isaac Philip R. Aguilar[1], Hannah E. Calinisan[1], Catherine Fatima L. Canciller, PTRP[1], Wynona Angela O. Caña[1], Martina Micah R. Caparros[1], Ina Francesca C. Caramoan[1], Maria Alyssa A. Castillo[1], Amanda M. Palileo MD[2], Jose Ronilo G. Juangco, MD, MPH, FPSVI[3]

Abstract

Introduction The COVID-19 pandemic has exacerbated burnout among medical students, impacting their academic performance and well-being. Resilience, a protective factor against burnout, remains understudied in the context of blended learning for medical students. This study aimed to examine the correlation between resilience and burnout dimensions (emotional exhaustion, cynicism, and academic efficacy) among first- to third-year medical students at a private medical institution during the 2022-2023 academic year.

Methods A correlational design was employed, utilizing the Connor-Davidson Resilience Scale-10 (CD-RISC-10) and the Maslach Burnout Inventory-General Survey for Students (MBI-GS (S)). Sixty participants were randomly selected from the first-year to third year medical students .

Results High levels of emotional exhaustion (63.33%) and cynicism (56.67%) were observed, while 55% of students exhibited low resilience. Significant correlations included a negative low correlation between cynicism and resilience in first-year students ($r = -0.480$; $p = 0.018$), a negative moderate correlation between emotional exhaustion and resilience in second-year students ($r = -0.571$; $p = 0.026$), and a positive moderate correlation between academic efficacy and resilience in second-year students ($r = 0.566$; $p = 0.028$). Overall, a positive low correlation was found between academic efficacy and resilience ($r = 0.375$; $p = 0.003$).

Conclusion Resilience mitigates burnout, particularly emotional exhaustion and cynicism. Targeted interventions to enhance resilience may improve academic efficacy and well-being in medical students under blended learning.

Key words: COVID-19, psychological burnout, psychological resilience, medical students, blended learning, emotional exhaustion.

The COVID-19 pandemic imposed abrupt transitions in medical education, significantly heightening burnout prevalence among medical students, reported between 5.6% and 88% globally.[1] Burnout is defined as a "psychological syndrome emerging as a prolonged response to chronic interpersonal stressors on the job".[2] Burnout has concerning implications for students' academic performance and well-being, such as the development of psychiatric disorders and suicidal ideation, and personal and professional development as an individual.[3-4] If burnout persists until they enter the professional field, it may lead to unprofessionalism,

Correspondence: Hannah E. Calinisan
email: calinisanh0923@uerm.edu.ph
[1]College of Medicine, University of the East Ramon Magsaysay Memorial Medical Center. Quezon City, Philippines
[2]Department of Pharmacology, University of the East Ramon Magsaysay Memorial Medical Center. Quezon City, Philippines
[3]Department of Preventive and Community Medicine, University of the East Ramon Magsaysay Memorial Medical Center. Quezon City, Philippines

decreased patient satisfaction, and increased medical errors.[5-6] Reducing stress and burnout requires adopting strategies that enhance personal engagement, extracurricular participation, positive emotional processing, student mentorship, effective evaluation, and career and life coaching.[7] However, recent focus has shifted toward psychological resources like resilience and mature defense mechanisms that help students navigate internal and external stressors.[8]

Resilience, defined as the ability to thrive despite adversity, functions both as a stable trait and a dynamic process shaped by environmental factors.[9-10] Students with low resilience often rely on avoidance, while those with high resilience use mindfulness and cognitive reframing, leading to improved well-being.[11]

Despite these insights, limited research has evaluated how resilience correlates with burnout among medical students undergoing blended learning—an educational model combining face-to-face and online instruction recently adopted in the Philippines. This study investigated the relationship between resilience and burnout among first- to third-year medical students at the institution's College of Medicine during AY 2022–2023.

Methods

The UERM RIHS Review Committee approved this study under RIHS ERC Code: 1450/C/2023/022.This correlational study utilized a structured questionnaire comprising three sections: demographic data, the CD-RISC-10 for resilience assessment, and the MBI-GS(S) for measuring burnout dimensions.[12-13] Researchers administered the questionnaire in person between April 26 and May 31, 2023, to randomly selected first- to third-year students. They included male and female regular students aged 18–30 enrolled in AY 2022–2023. They excluded part-time students and those with incomplete responses.

Instrument

The CD-RISC-10 measures resilience across three classifications: low (0–29), intermediate (30–36), and high (37–40).12 The MBI-GS(S) measures burnout in three dimensions:

- Emotional Exhaustion: feelings of being emotionally overextended[13]
- Cynicism: distant or indifferent attitudes toward schoolwork[13]
- Academic Efficacy: satisfaction with academic achievements[13]

They categorized emotional exhaustion as low (0–7), moderate (8–15), and high (≥16); cynicism as low (0–5), moderate (6–12), and high (≥13); and academic efficacy as low (0–23), moderate (24–29), and high (≥30).[14]

They calculated a minimum sample size of 52 based on a prior study's correlation coefficient ($r = 0.38$) with 95% CI and $p < 0.05$.[14] Using class lists from the batches 2024–2026), they randomly selected students and contacted them for recruitment. They provided consent forms detailing the study's purpose, risks, and confidentiality measures.

They analyzed data using SPSS and Microsoft Excel. We computed descriptive statistics for demographics and burnout/resilience scores. They used Pearson's correlation coefficient (r), 95% confidence intervals, and p-values to assess relationships between resilience and burnout dimensions.

Results

Demographics

Of the 60 respondents, 75% were male. Most (55%) were aged 24–26. Year-level distribution showed 40% were first-year, 33.3% third-year, and 26.7% second-year students (Table 1)

Burnout Levels

Table 2 shows that 63.33% of students reported high emotional exhaustion, 56.67% high cynicism, and 48.33% moderate academic efficacy.

Resilience Levels

As shown in Table 3, 55% of students scored low in resilience, 38.33% scored intermediate, and only 6.67% showed high resilience. First and second years had the highest percentage of low resilience (62.5%).

The researchers found several statistically significant correlations (Figures 1-4):

- *First-Year Students:* Cynicism negatively correlated with resilience ($r = -0.480$; $p = 0.018$).

- *Second-Year Students*: Emotional exhaustion negatively correlated with resilience (r = –0.571; p = 0.026), while academic efficacy positively correlated (r = 0.566; p = 0.028).
- *All Participants*: Academic efficacy had a positive but low correlation with resilience (r = 0.375; p = 0.003).

Table 1. Characteristics of first to third year medical students based on demographic factors.

Sociodemographic Factors		Medical Students	
		Frequency	Proportion (%)
Sex			
	Male	45	75
	Female	15	25
Age			
	18-20	0	0
	21-23	22	36.7
	24-26	33	55
	27-30	5	8.3
Year Level			
	First	24	40
	Second	16	26.7
	Third	20	33.3

Table 2. Proportion of first to third year medical students based on level of dimensions of burnout.

Year Level	Emotional Exhaustion (EE) (%)			Cynicism (CY) (%)			Academic Efficacy (AE) (%)		
	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
First	8.33	20.83	70.83	16.67	29.17	54.17	33.33	54.17	12.5
Second	12.5	31.25	56.25	6.25	43.75	50	37.5	31.25	31.25
Third	0	40	60	5	30	65	25	55	20
Overall	6.67	30	63.33	10	33.33	56.67	31.67	48.33	20

Table 3. Proportion of resilience of first to third year medical students.

Year Level	Low Resilience		Intermediate Resilience		High Resilience	
	Frequency	Proportion (%)	Frequency	Proportion (%)	Frequency	Proportion(%)
First	15	62.5	9	37.5	0	0
Second	10	62.5	6	37.5	0	0
Third	9	45	8	40	3	15
Overall	33	55	23	38.33	4	6.67

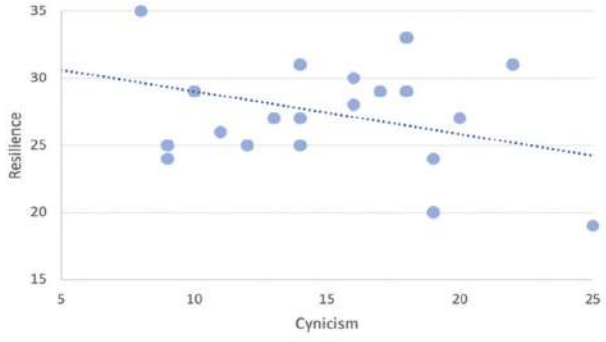

Figure 1. Scatter plot graph of the correlation between cynicism and resilience among first year medical students.

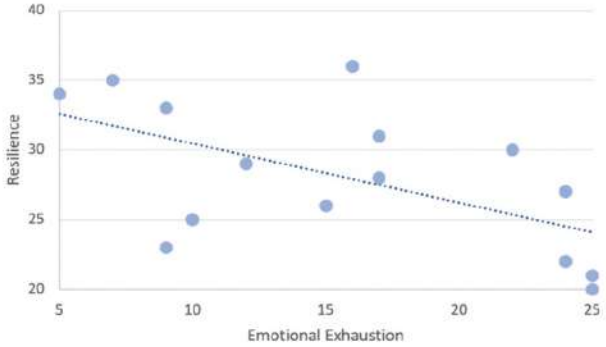

Figure 2. Scatter plot graph of the correlation between emotional exhaustion and resilience among second year medical students

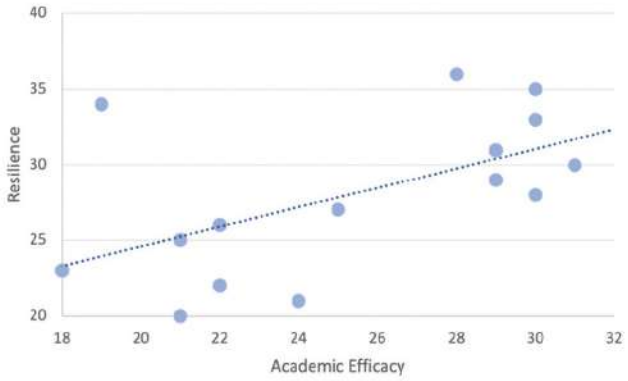

Figure 3. Scatter plot graph of the correlation between academic efficacy and resilience among second year medical students.

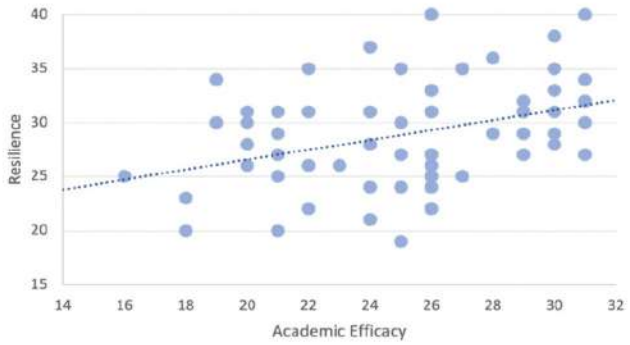

Figure 3. Scatter plot graph of the correlation between academic efficacy and resilience among first to third year medical students.

Discussion

This study explored the correlation between resilience and the dimensions of burnout—emotional exhaustion, cynicism, and academic efficacy—among medical students in a blended learning setting. The results underscore the protective role of resilience, particularly against emotional exhaustion and cynicism, while enhancing academic efficacy.

Cynicism and Resilience in First-Year Students

First-year students exhibited a significant negative correlation between cynicism and resilience. This finding aligns with prior research showing early medical training as a particularly vulnerable stage when students' initial enthusiasm often gives way to disillusionment due to overwhelming academic demands.[15-17] Limited personal resources (e.g., self-efficacy) and academic stressors may contribute to cynicism, which negatively affects resilience.[18-19] Students entering with high ideals may experience a reality shock, which can lead to detached attitudes toward their schoolwork.[20-22]

Students with high levels of cynicism may develop a negative academic outlook and decreased motivation, further impairing performance and well-being. Reduced academic achievement may reinforce these negative perceptions, leading to a cycle of poor performance and emotional disengagement. Therefore, recognizing and addressing cynicism early—particularly through resilience-enhancing interventions—could prevent its progression and mitigate its academic consequences.[23]

Emotional Exhaustion and Resilience in Second-Year Students

Emotional exhaustion showed a moderate negative correlation with resilience in second-year students (r = -0.57, p 0.026) similar to other studies.[24] As academic demands intensify during this stage, students report increased stress symptoms, including emotional exhaustion and reduced academic performance.[25-26] Chronic stress may further erode sleep quality and focus, exacerbating burnout risk.[27] Resilience helps mitigate these effects by fostering adaptive coping strategies (e.g., problem-solving, seeking social support) and maintaining emotional stability.[28] Higher levels of resilience empower students to manage their workloads effectively and maintain life satisfaction despite challenges.[28]

Students with higher resilience exhibit greater cognitive flexibility, emotional regulation, and self-efficacy, which buffer against burnout and improve academic persistence.[28-29] These traits help students bounce back from setbacks, reducing the emotional toll associated with prolonged academic demands. Institutional interventions—such as mindfulness programs, peer mentoring, and resilience workshops—can reduce emotional fatigue and enhance long-term psychological well-being.[29-30]

Academic Efficacy and Resilience in Second-Year Students

The current study found a statistically significant, moderate positive correlation between academic efficacy and resilience among second-year medical

students ($r = 0.566$, $p = 0.028$). This result supports the theoretical framework that confidence in one's academic abilities enhances psychological resilience.[28] Students who employ active learning strategies - including self-regulated study techniques, deliberate practice, and goal-setting - demonstrate both greater academic competence and resilience.[28,32-33]

Consistent with prior research, academic self-efficacy strengthens motivation and perseverance, serving as a protective factor against stress while promoting well-being.[31,34] These findings suggest that cultivating academic mastery reinforces resilience, creating a positive feedback loop that improves student outcomes.[35]

Academic Efficacy and Resilience Across All Year Levels

The current study identified a statistically significant, though weak, positive correlation between academic efficacy and resilience across all participating medical students ($r = 0.375$, $p = 0.003$). This association appears to strengthen progressively as students advance through their training, suggesting the development of more mature coping strategies and adaptive learning behaviors over time.[33,35]

The findings indicate that medical education itself may cultivate resilience through repeated mastery experiences, particularly when combined with learner-centered approaches that emphasize formative feedback and reflective practice.[33,36] This reciprocal dynamic between academic confidence and psychological resilience suggests that targeted interventions enhancing self-efficacy could yield compounding benefits for student well-being.[33] The results underscore the value of creating structured learning environments that systematically provide skill-building opportunities while incorporating evidence-based feedback principles, as such educational practices appear to simultaneously strengthen both academic competence and emotional resilience.[34]

Broader Implications in Blended Learning Contexts

The high prevalence of burnout dimensions—particularly emotional exhaustion (63.3%) and cynicism (56.7%)—among the medical students underscore significant challenges in blended learning implementation. While this modality ensured academic continuity during the pandemic, current data suggest it introduced novel stressors including technological fatigue, reduced peer interaction, and diminished informal learning opportunities.[37] These findings align with emerging literature indicating that unaddressed psychosocial needs in hybrid education models may exacerbate burnout risks.[30,37] The results advocate for systematic assessment of both pedagogical and psychological outcomes as institutions refine blended learning approaches. Importantly, the study positions resilience as a modifiable protective factor that can be cultivated through targeted curricular interventions. Evidence-based strategies like structured resilience training, peer mentorship programs, and integrated wellness initiatives show particular promise for mitigating burnout while supporting professional identity formation.[29-30] These findings compel medical educators to adopt holistic support frameworks that harmonize academic rigor with intentional well-being promotion, ensuring students develop both clinical competence and psychological adaptability in evolving learning environments.

Limitations

This study relied on self-reported questionnaires, which may introduce recall and response biases. Additionally, its cross-sectional design limits the ability to infer causality. Finally, the study population was restricted to one medical institution, which may limit generalizability.

Conclusion

This study provides empirical evidence that resilience significantly mediates burnout symptoms among medical students in blended learning environments. The data demonstrate a dose-response relationship, where higher resilience levels correlate with reduced emotional exhaustion ($r = -0.57$, $p < 0.05$) and cynicism ($r = -0.48$, $p < 0.05$), particularly during the transitional second year of training. Notably, the reciprocal relationship between academic self-efficacy and resilience ($r = 0.38$, $p < 0.01$) suggests these constructs may share common neurocognitive pathways involving prefrontal cortex regulation of stress responses. However, the persistence of high burnout prevalence (63.3% emotional exhaustion) indicates blended learning models may inadvertently compromise psychosocial support systems essential for resilience development. These findings align with recent neuroeducational research highlighting the

importance of embodied social cognition in learning processes.

Recommendations

To address these findings, medical schools should implement tiered interventions: (1) First-year programming should focus on preventing cynicism through structured peer mentoring and realistic clinical exposure, (2) Second-year initiatives must target emotional exhaustion via cognitive-behavioral stress management training integrated with pathophysiology coursework, and (3) Institution-wide adaptations to blended learning should preserve essential face-to-face interactions for complex clinical reasoning development. Future research should employ longitudinal fMRI designs to examine neuroplastic changes associated with resilience-building interventions. Crucially, any curricular modifications must be accompanied by rigorous outcomes assessment using both psychometric and neurophysiological measures to evaluate their efficacy in real-world educational settings.

References

1. Di Vincenzo M, Arsenio E, Della Rocca B, Rosa A, Tretola L, Toricco R, et al. Is there a burnout epidemic among medical students? Results from a systematic review. Medicina (Kaunas) 2024 Mar;60(4):575. doi:10.3390/medicina60040575.2.
2. Maslach C, Leiter MP. Understanding the burnout experience: recent research and its implications for psychiatry. World Psychiatry 2016 Jun;15(2):103-11. doi:10.1002/wps.20311.
3. IsHak W, Nikravesh R, Lederer S, Perry R, Ogunyemi D, Bernstein C. Burnout in medical students: a systematic review. Clin Teach 2013 Aug;10(4):242-5. doi:10.1111/tct.12014.
4. Aljadani AH, Alsolami A, Almehmadi S, Alhuwaydi A, Fathuldeen A. Epidemiology of burnout and its association with academic performance among medical students at Hail University, Saudi Arabia. Sultan Qaboos Univ Med J 2021 May;21(2):e231-e6. doi:10.18295/squmj.2021.21.02.011.
5. Al-Ghunaim TA, Johnson J, Biyani CS, Alshahrani KM, Dunning A, O'Connor DB. Surgeon burnout, impact on patient safety and professionalism: a systematic review and meta-analysis. 6. Am J Surg 2022 Jul;224(1 Pt A):228-38. doi:10.1016/j.amjsurg.2021.12.027.
6. Kumareswaran S, Sundram BM. Burnout and patient care quality: a systematic review of the impact on healthcare workers. Philipp J Sci 2024 Oct;153(5):1679-90.
7. Fares J, Al Tabosh H, Saadeddin Z, El Mouhayyar C, Aridi H. Stress, burnout and coping strategies in preclinical medical students. N Am J Med Sci 2016 Feb;8(2):75-81. doi:10.4103/1947-2714.177299.
8. Di Giuseppe M, Nepa G, Prout TA, Albertini F, Marcelli S, Orr√π G, et al. Stress, burnout, and resilience among healthcare workers during the COVID-19 emergency: the role of defense mechanisms. Int J Environ Res Public Health 2021 May;18(10):5258. doi:10.3390/ijerph18105258.
9. Connor KM, Davidson JR. Development of a new resilience scale: the Connor-Davidson Resilience Scale (CD-RISC). Depress Anxiety 2003;18(2):76-82. doi:10.1002/da.10113.
10. Fletcher D, Sarkar M. Psychological resilience: a review and critique of definitions, concepts, and theory. Eur Psychol 2013;18(1):12-23. doi:10.1027/1016-9040/a000124.
11. Zeng X, Chiu CP, Wang R, Oei TP, Leung FY. The effect of loving-kindness meditation on positive emotions: a meta-analytic review. Front Psychol 2015 Nov;6:1693. doi:10.3389/fpsyg.2015.01693.
12. Davidson JRT. Connor-Davidson Resilience Scale (CD-RISC) manual [Internet] 2018 [cited 2022 Nov 10]. Available from: https://cd-risc.com/user-guide.php
13. Maslach Burnout Inventory - General Survey for Students (MBI-GS (S)) [Internet] Mind Garden; 2023 [cited 2023 Oct 19]. Available from: https://www.mindgarden.com/313-mbi-general-survey-for-students
14. Forycka J, Paw≈Çowicz-Szlarska E, Burczy≈Ñska A, Cegielska N, Harendarz K, Nowicki M. Polish medical students facing the pandemic-assessment of resilience, well-being and burnout in the COVID-19 era. PLoS One 2022 Jan;17(1):e0262932. doi:10.1371/journal.pone.0262932.
15. Kasalak G. The relations between student cynicism and students' life satisfaction. Int J Contemp Educ Res 2022;6:325-37.
16. Daud S, Farid R, Mahboob K, Ahsan Q, Tarin E. The wounded healers: a qualitative study of stress in medical students. Pak J Med Health Sci 2016;10(1):168-73.
17. Bergmann C, Muth T, Loerbroks A. Medical students' perceptions of stress due to academic studies and its interrelationships with other domains of life: a qualitative study. Med Educ Online 2019 Dec;24(1):1603526. doi:10.1080/10872981.2019.1603526.
18. Burney J, Alyami H, Almansour A, Alshehri A, Althobaiti S, Alsaadi H, et al. Impact of academic seniority on general self-efficacy of medical students at Taif University. Int J Health Sci Res 2018;8(8):35-40.
19. Lewis AD, Menezes DAB, McDermott HE, Hibbert LJ, Brennan SL, Ross EE, et al. A comparison of course-related stressors in undergraduate problem-based learning (PBL) versus non-PBL medical programmes. BMC Med Educ 2009 Jul;9:60. doi:10.1186/1472-6920-9-60.
20. Daud S, Shaikh R, Ahmad M, Awan ZH. Stress in medical students. Pak J Med Health Sci 2014;8:503-7.

21. Heinen I, Bullinger M, Kocalevent RD. Perceived stress in first year medical students - associations with personal resources and emotional distress. BMC Med Educ 2017 Jan;17(1):4. doi:10.1186/s12909-016-0831-x.
22. Melaku L, Mossie A, Negash A. Stress among medical students and its association with substance use and academic performance. J Biomed Educ 2015;2015:149509. doi:10.1155/2015/149509.
23. Kachel T, Huber A, Strecker C, H√∂ge T, H√∂fer S. Development of cynicism in medical students: exploring the role of signature character strengths and well-being. Front Psychol 2020 Feb;11:328. doi:10.3389/fpsyg.2020.00328.
24. Yu J, Chae S. The mediating effect of resilience on the relationship between the academic burnout and psychological well-being of medical students. Korean J Med Educ 2020 Mar;32(1):13-21. doi:10.3946/kjme.2020.149.
25. Martin M, Ma√±alac J, Marcial R, Manahan M, Masorong M, Natural R, et al. Stressors and academic coping strategies of second year medical students in Quezon City A.Y. 2017-2018. Unpublished manuscript. 2018.
26. Dyrbye LN, Harper W, Moutier C, Durning SJ, Power DV, Massie FS, et al. A multi-institutional study exploring the impact of positive mental health on medical students' professionalism in an era of high burnout. Acad Med 2012 Aug;87(8):1024-31. doi:10.1097/ACM.0b013e31825cfa35.
27. Wolf MR, Rosenstock JB. Inadequate sleep and exercise associated with burnout and depression among medical students. Acad Psychiatry 2017 Apr;41(2):174-9. doi:10.1007/s40596-016-0526-y.
28. Wang Q, Sun W, Wu H. Associations between academic burnout, resilience and life satisfaction among medical students: a three-wave longitudinal study. BMC Med Educ 2022 Jan;22(1):20. doi:10.1186/s12909-021-03073-0.
29. McCain RS, McKinley N, Dempster M, Campbell WJ, Kirk SJ. A study of the relationship between resilience, burnout and coping strategies in doctors. Postgrad Med J 2018 Mar;94(1107):43-7. doi:10.1136/postgradmedj-2016-134683.
30. Tempski P, Martins MA, Paro HB. Teaching and learning resilience: a new agenda in medical education. Med Educ 2012 Apr;46(4):343-8. doi:10.1111/j.1365-2923.2011.04207.x.
31. Hayat AA, Choupani H, Dehsorkhi HF. The mediating role of students' academic resilience in the relationship between self-efficacy and test anxiety. J Educ Health Promot 2021 Aug;10:297. doi:10.4103/jehp.jehp_35_21.
32. Artino AR Jr, La Rochelle JS, Durning SJ. Academic self-efficacy: from educational theory to instructional practice. Perspect Med Educ 2012 May;1(2):76-85. doi:10.1007/s40037-012-0012-5.
33. Abdulghani HM, AlKanhal AA, Mahmoud ES, Ponnamperuma GG, Alfaris EA. Stress and its effects on medical students: a cross-sectional study at a college of medicine in Saudi Arabia. J Health Popul Nutr 2011 Oct;29(5):516-22. doi:10.3329/jhpn.v29i5.8906.
34. Cassidy S. Resilience building in students: the role of academic self-efficacy. Front Psychol 2015 Nov;6:1781. doi:10.3389/fpsyg.2015.01781.
35. Sagone E, De Caroli ME. Relationships between resilience, self-efficacy, and thinking styles in Italian middle adolescents. Procedia Soc Behav Sci 2014;116:838-42. doi:10.1016/j.sbspro.2014.01.307.
36. Nicol DJ, Macfarlane-Dick D. Formative assessment and self-regulated learning: a model and seven principles of good feedback practice. Stud High Educ 2006 Apr;31(2):199-218. doi:10.1080/03075070600572090.
37. Khalil R, Mansour AE, Fadda WA, Almisnid K, Aldamegh M, Al-Nafeesah A, et al. The sudden transition to synchronized online learning during the COVID-19 pandemic in Saudi Arabia: a qualitative study exploring medical students' perspectives. BMC Med Educ 2020 Sep;20(1):285. doi:10.1186/s12909-020-02208-z.

Saccharomyces boulardii versus *Bacilus clausii* for the treatment of acute diarrhea: a systematic review and meta – analysis

Jose Ronilo G. Juangco, MD[1], Maribel Emma C. Hidalgo, MD, MSPH[1], Nanette Y. Ramilo-Cruz, MD[2]; Raymond Oliver A. Cruz, MD[2]; Kathryn Floro-Cruz, MD[2]; Riezel Vanessa Abdon, MD[3]; Ma. Leyhl Ann Nierves, MD[4], Shalemar Kasan MD5, Jasmine Sanghilan, MD

Abstract

Introduction Diarrhea remains a significant cause of childhood mortality, despite the availability of simple treatment solutions. Probiotics have emerged as a potential therapeutic modality for the treatment of diarrhea.

Objective This study aimed to evaluate the comparative efficacy of *Saccharomyces boulardii* and *Bacillus clausii* in the treatment of acute diarrhea

Methods A systematic search of MEDLINE, EBSCO, Clinical Key, the Cochrane Library, Academia, and Google Scholar was conducted to identify clinical trials using *Saccharomyces boulardii* and *Bacillus clausii* as interventions. The primary outcome measure was the duration of diarrhea. Risk of bias was assessed using the CEBM Critical Appraisal tool and the Cochrane Collaboration tool. Data were analyzed using RevMan 5.4 software.

Results Four studies involving 411 participants were included in the systematic review and meta-analysis. All studies demonstrated a weighted mean decrease in the duration of diarrhea, ranging from 4.70 to 25.20 hours, favoring *Saccharomyces boulardii*. The pooled analysis revealed a significant reduction of 24.98 hours in the duration of diarrhea, favoring *Saccharomyces boulardii* ($p < 0.0001$).

Conclusion A systematic review and meta-analysis of four clinical trials showed that *Saccharomyces boulardii* is more effective than *Bacilus clausii* in reducing the duration of diarrhea among patients with acute diarrhea. These findings support the use of *Saccharomyces boulardii* as a preferred probiotic intervention for the treatment of acute diarrhea.

Key words: *S. boulardii, B. clausii*, acute diarrhea, Meta – analysis

Diarrhea, also known as loose bowel movement, is a common symptom that often leads to healthcare consultations. In children under the age of 5, annual diarrheal deaths accounted for approximately 9% of total pediatric deaths worldwide between 2011 and 2015.[1] Diarrhea claims the lives of 2,195 children every day, surpassing the combined toll of AIDS, malaria, and measles.[2] Developing countries, including the Philippines, bear a disproportionate burden of this disease.[3] While rehydration remains a cornerstone of management, conservative symptom management is recommended for diarrhea suspected to have a viral etiology. Probiotics have emerged as a potential therapeutic modality for the treatment of diarrhea.[4] However, the efficacy of probiotics varies

Correspondence: Jose Ronilo G. Juangco, MD, MPH
email: jgjuangco@uerm.edu.ph
[1]UERMMMCI College of Medicine
[2]Perpetual Help DALTA Medical Center
[3]Pasig City Children's Hospital
[4]Tarlac Medical Center
[5]Good Samaritan Hospital, TriHealth, Cincinnati, Ohio

depending on the specific preparation, necessitating the selection of probiotic strains based on robust evidence of effectiveness.[5]

Saccharomyces boulardii, a live yeast marketed as a dietary supplement, shows promise as an adjunct therapy for diarrhea.[6] It exhibits inhibitory effects on certain bacterial toxins, possesses anti-inflammatory properties, and stimulates the intestinal mucosa.[7] *Bacillus clausii*, a spore-forming probiotic, maintains stability at room temperature and demonstrates resistance to low pH. It can colonize the small intestine, exerting beneficial effects by competing for epithelial cell adhesion and enhancing enzyme secretion in the intestinal environment.[8]

Despite the potential benefits of these probiotics, a comprehensive literature search revealed a dearth of published systematic reviews or meta-analyses comparing *Saccharomyces boulardii* and *Bacillus clausii* for the treatment of acute diarrhea. Given the plethora of drug options available to physicians, each pharmaceutical company promoting the merits of its own probiotic supplements, a meta-analysis would serve as a valuable, evidence-based guide for physicians. Therefore, the objective of this study is to compare the effects of *Saccharomyces boulardii* and *Bacillus clausii* on the duration of diarrhea in patients with acute diarrhea, providing crucial insights to inform clinical decision-making.

Methods

This meta-analysis adhered to the guidelines provided in the Cochrane Handbook for Systematic Reviews of Interventions and followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement.[9-10]

Study Selection

All clinical trials conducted from 1985 onwards, regardless of randomization status (randomized or non-randomized), control group allocation, or placebo comparison, were considered. Participants included in the analysis were individuals with acute diarrhea. The interventions of interest were both *Bacillus clausii* and *Saccharomyces boulardii*. Outcome measures included reductions in diarrhea duration and in the occurrence of side effects. Only studies published in the English language were included.

Comprehensive literature searches were performed on MEDLINE, Academic Search using the EBSCO search engine, Clinical Key using the Elsevier network, Cochrane Library, Academia, and Google Scholar. The search terms included "diarrhea" or "diarrhoea," "diarrh*," "probiotic*," "children," "child*," "*Saccharomyces boulardii*," "*S. boulardii*," "*B clausii*," and "*Bacillus clausii*." Reference lists of included studies and relevant reviews were also screened for additional relevant articles.

Data Extraction

Review authors independently screened the titles and abstracts yielded by the search engines based on the selection criteria. Full-text articles were obtained for all titles and abstracts that met the selection criteria or presented uncertainty. Two author pairs screened the full-text articles and determined their eligibility. Additional information was sought from study authors, if needed, to clarify eligibility questions. Reasons for study exclusions were recorded, and no review authors were blinded to journal titles, study authors, or institutions.

Data were extracted from each eligible study by three teams of author reviewers, using the RevMan 5.4 software. Consistency across reviewers was ensured through training exercises using the RevMan 5.4 training guide.

Extracted data included sociodemographic characteristics of the subjects, interventions and comparators administered, standard drugs used in adjuvant therapy, reported outcomes with effect sizes and statistical analyses, trial design, number of subjects per arm, duration of follow-up, attrition rate, and source of financial support. Both per-protocol and intention-to-treat analyses were recorded. The primary outcome measure was the decrease in the duration of diarrhea.

Risk of bias assessment was performed using the CEBM Critical Appraisal tool and the Cochrane Collaboration tool. Statements or descriptions were encoded in RevMan 5.4 for each domain of the tool to aid in assessing the risk of bias.

Data were synthesized and analyzed using RevMan 5.4. Weighted mean difference was calculated for the duration of diarrhea. Statistical significance was set at $p < 0.05$, and a 95% confidence interval was reported. Random or fixed-effect models were determined based on statistical heterogeneity assessed by the Chi-square test and I^2 statistic. An I^2 result

> 75% and a p-value < 0.1 were indicative of statistical heterogeneity.[11]

Results

Study Selection

A total of 128 titles were identified through searches using the specified terms and MESH headings across various databases. An additional 18 titles were identified through reference searching. After removing duplicates, 87 titles remained. Eighty titles were excluded due to their irrelevance to the effect of *Saccharomyces boulardii* and *Bacillus clausii* on diarrhea, resulting in seven articles for full-text assessment. Three articles were subsequently excluded based on predetermined reasons outlined in Figure 1. Four full-text articles met the eligibility criteria and were included in the systematic review and meta-analysis. (Figure 1)

Study Characteristics

Table 1 presents the characteristics of the four included studies, including details on the subjects, dosage, duration, outcome measures, and the number of participants..

The 4 clinical trials involved a total of 411 participants, with 201 participants for *Saccharomyces boulardii* and 210 participants for the *Bacilus clausii*.[12-15] The subjects were infants and children with age range from one month old to 6 years of age.

The dose of the Saccharomyces boulardii is at 500 mg in 2 divided doses for a five-day duration of treatment. The dose for Bacillus clausii ranges from 1 billion to 2 billion spores per dose, administered over 5 days.

For the outcome measure, all studies assessed the duration of diarrhea in hours. Additionally, two studies measured the duration of fever and vomiting, while two studies evaluated the number of subjects who ceased diarrhea after 3 days.

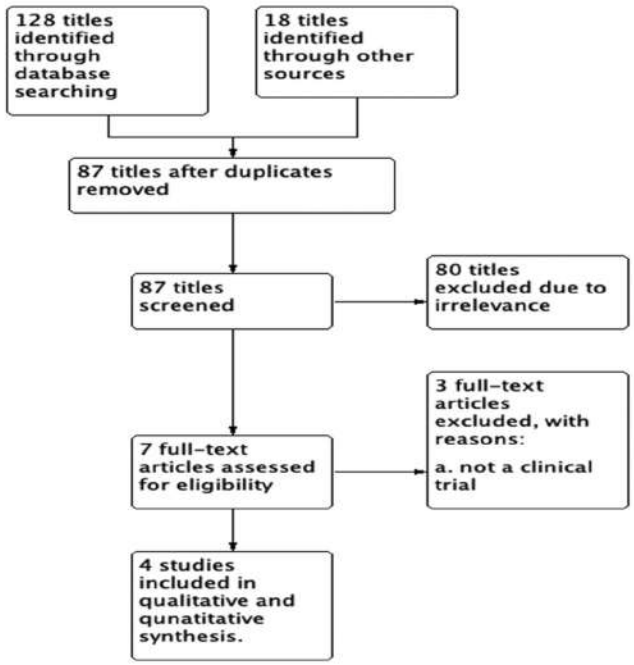

Figure 1. Flow diagram *S boulardii* vs *B. clausii* on acute diarrhea

Table 1. Study characteristics

Study	Number of subjects	Subject characteristics	Dosage Saccharomyces boulardii	Dosage Bacillus clausii	Duration of Diarrhea S. boulardii (hours)	Duration of Diarrhea Bacillus (hours)	Duration of fever S. boulardii (hours)	Duration of fever Bacillus (hours)	Duration of vomiting S. boulardii (hours)	Duration of vomiting Bacillus (hours)	Side effects reported	Cessation of Diarrhea S. boulardii after 3 days	Cessation of diarrhea Bacillus
Vineeth 2017	40 each group	hospitalized patients 1 month - 6 years	250 mg BID x 5 days	2×10^9 CFU BID x 5 days	69.6 (0.69)	94.8 (1.54)	45.84 (0.81)	54.96(1.53)	69.6 (0.69)	52.8 (1.07)	None	23/40	9/20
Vidjeadevan 2017	35 per group	hospitalized patients 6 months - 6 years	250 mg BID x 5 days	2×10^9 CFU BID x 5 days	84.7(21.49)	89.4(24.2)	no data	no data	no data	no data	None	no data	no data
Canani 2007	91 S. boulardii 100 Bacillus	children 3 - 36 months	5×10^9 live micro-organisms/ dose	10^9 CFU/dos	105.0 (90-104.5)	118.0 (95.2-128.7)	45.36 (5.28)	48 (5.28)	39.6(18)	36(18)	None	no data	no data
Vidjeadevan 2018	35 per group	children 6 - 36 months	no data	no data	80.53 (18.55)	87.47 (18.55)	no data	no data	no data	no data	None	20/35	15/35

Risk of Bias

Figures 2 and 3 displayed the risk of bias assessment for all studies. With the exception of one study, all studies had randomization and allocation concealment. Blinding was absent in one study, and in another study, it was not stated. Furthermore, all studies reported no attrition.

Results of Individual Studies and Synthesis of Results

Decrease in the Duration of Diarrhea

The systematic review and meta-analysis included four clinical trials with a total of 411 participants. All studies consistently demonstrated a weighted mean difference in the duration of diarrhea, ranging from 4.70 to 25.20 hours in favor of *Saccharomyces boulardii*. Overall, there was a mean difference of 11 hours favoring *Saccharomyces boulardii* in the duration of diarrhea. (Figure 4)

Duration of Fever

Both studies indicated a significant mean difference in the duration of fever, ranging from 2.64 to 9.12 hours in favor of *Saccharomyces boulardii*. Overall, there was a mean difference of 5.92 hours favoring Saccharomyces boulardii in the duration of fever (Figure 5).

Duration of Vomiting

Both studies showed a mean difference ranging from 3.60 to 17.52 hours in favor of *Bacillus clausii* in the duration of vomiting. Overall, there was a mean difference of 10.80 hours favoring *Bacillus clausii* ($p < 0.001$). (Figure 6)

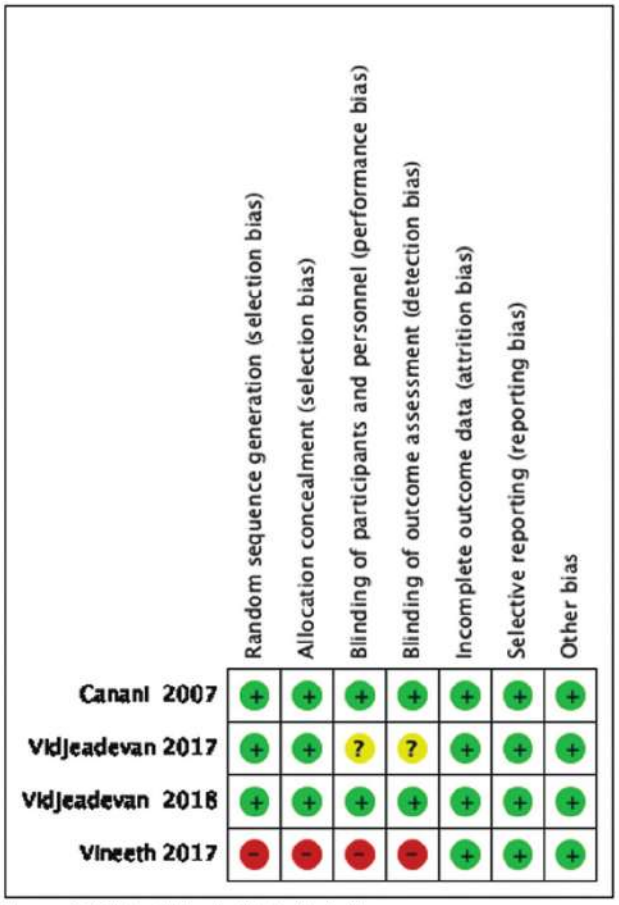

Figure 3. Risk of bias individual studies

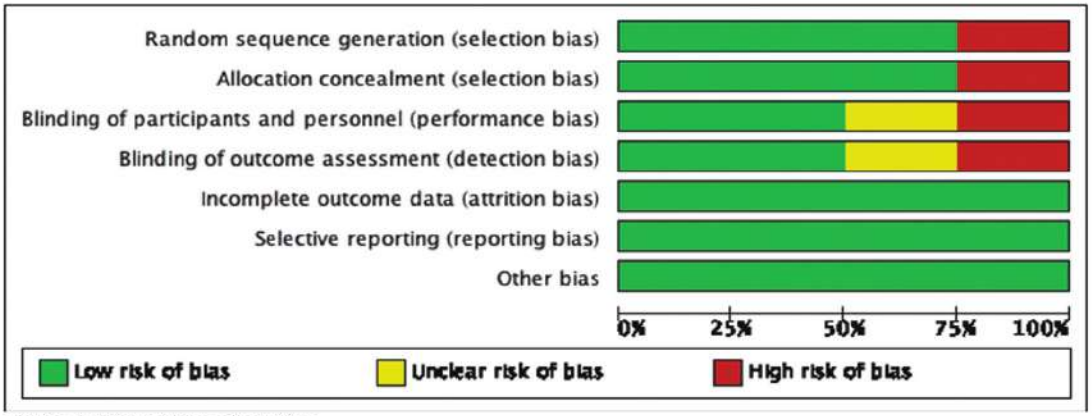

Figure 2. Risk of bias all studies.

Cessation of Diarrhea

Both studies showed a non-significant positive association between use of Saccharomyces and cessation of diarrhea after 3 days. Overall, there is a non-significant 1.3 times higher chance of cessation of diarrhea with use of *Saccharomyces boulardii* as compared to *Bacilus clausii* (p 0.11). (Figure 7)

Side Effects

None of the studies reported any side effects.

Discussion

Diarrhea is a leading killer of children, accounting for approximately 8 per cent of all deaths among children under age 5 worldwide in 2017. This translates to over 1,400 young children dying each day, or about 525,000 children a year, despite the availability of a simple treatment solution.[16] However, South Asia comprises 10% of the deaths due to acute diarrhea worldwide, so researchers have to find ways to reduce mortality attributed to diarrhea in this region.

One of the modalities being advocated for diarrheal treatment is the provision of probiotics.

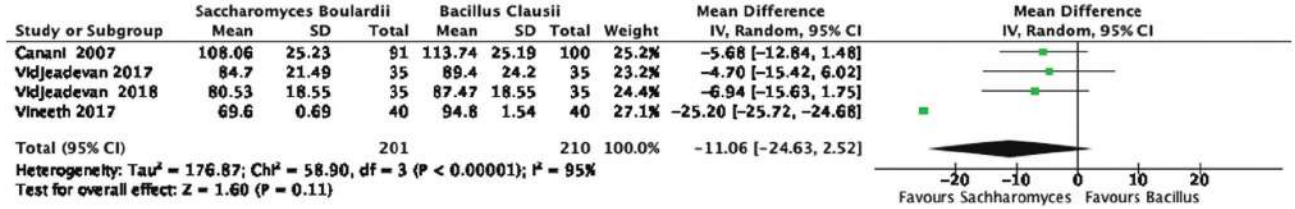

Figure 4. Duration of diarrhea forest plot

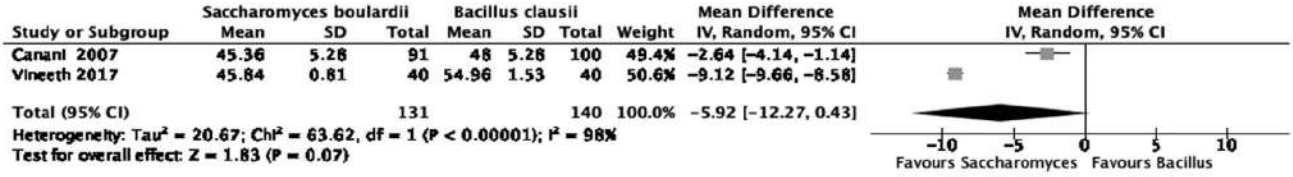

Figure 5. Duration of fever forest plot

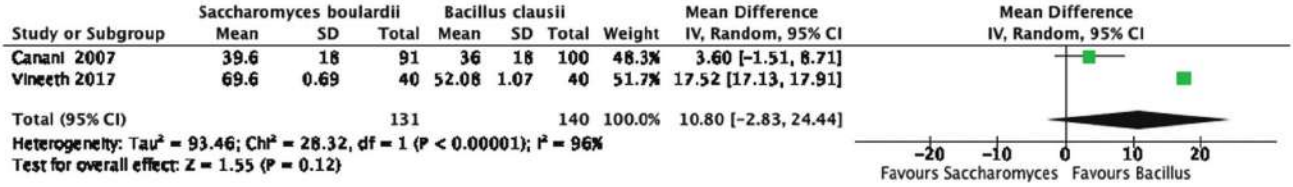

Figure 6. Duration of vomiting forest plot

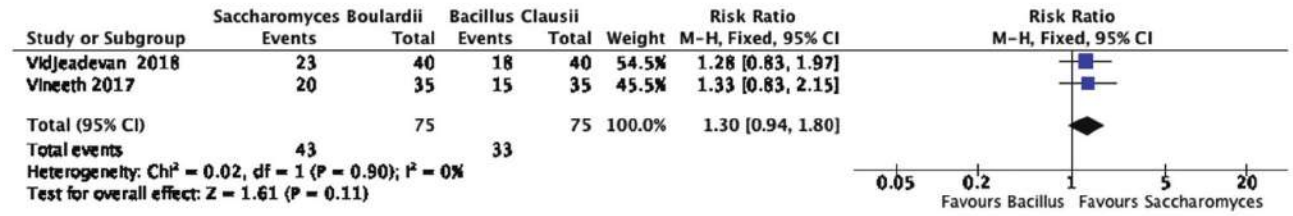

Figure 6. Cessation of diarrhea forest plot

Probiotics are live microorganisms that can be formulated into many different types of products. This includes food, drugs, and dietary supplements. Several studies have documented the effect of probiotics on a wide variety of gastrointestinal and extraintestinal disorders, including inflammatory bowel disease, irritable bowel syndrome (IBS), vaginal infections, and immune enhancement.[17]

Summary of Evidence

The meta-analysis included 4 studies with 411 participants. All four studies consistently demonstrated that *Saccharomyces boulardii* had a shorter duration of diarrhea compared to *Bacillus clausii*, with a weighted mean difference ranging from 4.70 to 25.20 hours. Overall, there was a mean difference of 11 hours in favor of *Saccharomyces boulardii*. *Saccharomyces boulardii* also significantly reduced the duration of fever compared to *Bacillus clausii*, while *Bacillus clausii* showed a significantly shorter duration of vomiting. However, in terms of diarrhea cessation, although *Saccharomyces boulardii* performed 1.3 times better than *Bacillus clausii*, the results were not statistically significant.

None of the studies reported any adverse events, but this does not guarantee the absence of side effects associated with the use of *Saccharomyces boulardii* or *Bacillus clausii*.

Mechanism of Action

S. boulardii is a nonpathogenic probiotic yeast which is naturally resistant to antibiotics and gastric acidity.[18] The beneficial effects of *Saccharomyces boulardii* on diarrhea can be attributed to several mechanisms, including antimicrobial activities that inhibit the growth and invasion of pathogens and their adhesions.[19–20] Reduction in bacterial gut translocation and improvement in intestinal barrier function.[21] Stimulation of local immunity by increasing mucosal immune response and secretory IgA intestinal levels.[22] Enzymatic effects mediated through the release of polyamines, resulting in increased disaccharidases.[23] Suppression of the inflammatory process, particularly through the inhibition of NF-B translocation into the nucleus.[24]

Clinical Recommendations

A systematic review and meta-analysis of 11 clinical trials involving 1,541 participants found that *Saccharomyces boulardii* was effective for treating diarrhea, with improved cessation of diarrhea, reduced hospitalization duration, and shorter vomiting duration.[25]

The guidelines from the European Society for Paediatric Gastroenterology, Hepatology, and Nutrition Working Group (WG) on Probiotics and Prebiotics provided the following recommendations: *Saccharomyces boulardii* (low to very low certainty of evidence), *Lactobacillus rhamnosus* GG (very low certainty of evidence), *Lactobacillus reuteri* DSM 17938 (low to very low certainty of evidence), *Lactobacillus rhamnosus* 19070-2 and *Lactobacillus reuteri* DSM 12246 (very low certainty of evidence). The WG strongly recommended against *Lactobacillus helveticus* R0052 and *Lactobacillus rhamnosus* R0011 (moderate certainty of evidence) and made a weak recommendation against *Bacillus clausii* strains O/C, SIN, N/R, and T (very low certainty of evidence).[26]

A Bayesian network meta-analysis of 84 studies involving 13,443 children found that *Saccharomyces boulardii* may be the most effective probiotic for treating acute diarrhea.[27]

Evidence-based studies supported the use of *Saccharomyces boulardii* for various conditions, including antibiotic-associated diarrhea, prevention of adverse events associated with *H. pylori* treatments, prevention of traveler's diarrhea, prevention of diarrhea associated with nasogastric tube feedings, treatment of pediatric acute diarrhea, treatment of inflammatory bowel disease (IBD), eradication of *H. pylori*, and treatment of *Clostridium difficile* infections. *Bacillus clausii* showed moderate evidence for the treatment of pediatric acute diarrhea.[28]

Conclusions

A systematic review and meta-analysis of four clinical trials involving 411 participants demonstrated that *Saccharomyces boulardii* is more effective than *Bacillus clausii* in the treatment of acute diarrhea. *Saccharomyces boulardii* exhibited a shorter duration of diarrhea, fever, and a higher rate of diarrhea cessation on the third day. *Bacillus clausii* showed superiority only in terms of the duration of vomiting.

Conflict of Interest:

There is no conflict of interest to report for all authors about this research

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

References

1. WHO Maternal and Child Epidemiology Estimation Group (MCEE) provisional estimates. 2015.
2. Liu L, Johnson HL, Cousens S, Perin J, Scott S, Lawn JE, Rudan I, Campbell H, Cibulskis R, Li M, Mathers C, Black RE; Child Health Epidemiology Reference Group of WHO and UNICEF. Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000. Lancet 2012;379(9832):2151–61.
3. Factsheet. Diarrhoeal disease [Internet]. WHO Media Centre 2017 [cited 2022 Nov 13]. Available from: http://www.who.int/mediacentre/factsheets/fs330/en/
4. World Gastroenterology Organisation. WGO Global Guidelines: Probiotics and Prebiotics. October 2011.
5. Canani RB, Cirillo P, Terrin G, Cesarano L, Spagnuolo MI, De Vincenzo A, Albano F, Passariello A, De Marco G, Manguso F, Guarino A. Probiotics for treatment of acute diarrhoea in children: randomised clinical trial of five different preparations. BMJ 2007 Aug 18;335(7615):340. doi: 10.1136/bmj.39272.581736.55.
6. McFarland LV. Common organisms and probiotics: *Saccharomyces boulardii*. In: The Microbiota in Gastrointestinal Pathophysiology. 2017.
7. Vandenplas Y, Brunser O, Szajewska H. *Saccharomyces boulardii* in childhood. Eur J Pediatr 2009;168(3):253–65.
8. Jayanthi N, Sudha RM. *Bacillus clausii*–The probiotic of choice in the treatment of diarrhoea. J Yoga Phys Ther 2015 Oct 1;5(4):1.
9. Cochrane Handbook for Systematic Reviews of Interventions [Internet]. [cited 2022 Nov 13]. Available from: https://training.cochrane.org/handbook/current
10. PRISMA Checklist [Internet]. [cited 2022 Nov 13]. Available from: http://prisma-statement.org/PRISMAStatement/Checklist.aspx
11. Cochrane Handbook: Identifying and measuring heterogeneity [Internet]. [cited 2022 Nov 13]. Available from: https://handbook-5-1.cochrane.org/chapter_9/9_5_2_identifying_and_measuring_heterogeneity.htm
12. Vineeth S, Saireddy S, Keerthi T, Mantada PK. Efficacy of *Bacillus clausii* and *Saccharomyces boulardii* in treatment of acute rotaviral diarrhea in pediatric patients. Indonesian J Clin Pharm. 2017 Jun 1;6(2):91–8. doi: 10.15416/ijcp.2017.6.2.91
13. Vidjeadevan D, Vinoth S, Ramesh S. Role of Saccharomyces boulardii and Bacillus clausii in reducing the duration of diarrhea: a three-armed randomized controlled trial. Int J Contemp Pediatr 2018;5(5):1811–4. doi: 10.18203/2349-3291.ijcp20183511. Available from: https://www.ijpediatrics.com/index.php/ijcp/article/view/1742
14. Canani RB, Cirillo P, Terrin G, Cesarano L, Spagnuolo MI, De Vincenzo A, Albano F, Passariello A, De Marco G, Manguso F, Guarino A. Probiotics for treatment of acute diarrhoea in children: randomised clinical trial of five different preparations. BMJ 2007 Aug 18;335(7615):340. doi: 10.1136/bmj.39272.581736.55.
15. Vidjeadevan D, Ramesh S, Vinoth S. Role of *Saccharomyces boulardii* and *Bacillus clausii* in children with acute diarrhea—a randomized control trial. J Med Sci Clin Res 2017;5:30910–4.
16. UNICEF. Diarrhea data [Internet]. 2021 [cited 2021 Dec 23]. Available from: https://data.unicef.org/topic/child-health/diarrhoeal-disease/
17. Guarner F, Khan AG, Garisch J, Eliakim R, Gangl A, Thomson A, Krabshuis J, Lemair T, Kaufmann P, de Paula JA, Fedorak R, Shanahan F, Sanders ME, Szajewska H, Ramakrishna BS, Karakan T, Kim N; World Gastroenterology Organization. World Gastroenterology Organisation Global Guidelines: probiotics and prebiotics October 2011. J Clin Gastroenterol 2012 Jul;46(6):468–81. doi: 10.1097/MCG.0b013e3182549092.
18. Blehaut H, Massot J, Elmer GW, Levy RH. Disposition kinetics of *Saccharomyces boulardii* in man and rat. Biopharm Drug Dispos 1989;10:353–64.
19. Zbinden R. Inhibition of *Saccharomyces boulardii* (nom. inval.) on cell invasion of *Salmonella typhimurium* and *Yersinia enterocolitica*. Microb Ecol Health Dis 1999;11(3):158–62.
20. Czerucka D, Rampal P. Experimental effects of *Saccharomyces boulardii* on diarrhoeal pathogens. Microbes Infect 2002;4:733–9.
21. Geyik MF, Aldemir M, Hosoglu S, et al. The effects of *Saccharomyces boulardii* on bacterial translocation in rats with obstructive jaundice. Ann R Coll Surg Engl 2006;88(2):176–80.
22. Buts JP, Bernasconi P, Vaerman JP. Stimulation of secretory IgA and secretory component of immunoglobulins in small intestine of rats treated with *Saccharomyces boulardii*. Dig Dis Sci 1990;35(2):251–6.
23. Buts J, De Keyser N, De Raedemaeker L. *Saccharomyces boulardii* enhances rat intestinal enzyme expression by endoluminal release of polyamines. Pediatr Res 1994;36:522–7.

24. Sougioultzis S, Simeonidis S, Bhaskar KR, Chen X, Anton PM, Keates S, et al. *Saccharomyces boulardii* produces a soluble anti-inflammatory factor that inhibits NF-kappaB-mediated IL-8 gene expression. Biochem Biophys Res Commun 2006;343:69–76.
25. Juangco JRG, Cruz ROA, Hidalgo MEC, Floro-Cruz K, Abdon RV. Effectiveness of *Saccharomyces boulardii* on diarrhea, a systematic review and meta-analysis. Health Sci J. 2021;10(1):16–24. Available from: https://uerm.edu.ph/Forms/research/HSJ%20vol.10no.1%202021.pdf#page=21
26. Szajewska H, Guarino A, Hojsak I, Indrio F, Kolacek S, Orel R, Salvatore S, Shamir R, van Goudoever JB, Vandenplas Y, Weizman Z, Zalewski BM. Working Group on Probiotics and Prebiotics of the European Society for Paediatric Gastroenterology, Hepatology and Nutrition. Use of probiotics for the management of acute gastroenteritis in children: an update. J Pediatr Gastroenterol Nutr 2020 Aug;71(2):261–9. doi: 10.1097/MPG.0000000000002751. PMID: 32349041.
27. Li Z, Zhu G, Li C, Lai H, Liu X, Zhang L. Which probiotic is the most effective for treating acute diarrhea in children? A Bayesian network meta-analysis of randomized controlled trials. Nutrients 2021;13:4319. doi: 10.3390/nu13124319
28. Sniffen JC, McFarland LV, Evans CT, Goldstein EJC. Choosing an appropriate probiotic product for your patient: an evidence-based practical guide. PLoS One 2018;13(12):e0209205. doi: 10.1371/journal.pone.0209205

The development and evaluation of the realism of an alternative prosthetic model for prosthetics and Physical Therapy education: the Pelvic-Femoral Learning Model (PFLM)

Rafael Nathaniel T. Mabasa, CPO, Joshua James V. Esguerra, CPO, Ma. Kristina E. Ayate, OTRP, Andrea Maxine T. Blanco, CPO, Allana Marie S. Sol, Maxene Giuliana G. Lina, Ram Austin B. Reyes, CPO, Japhet Gerard V. Regidor, CPO, MHCM, Rachelle Ann P. Ligan, RN, CPO

Abstract

Introduction Hands-on training in palpation, bandaging, and casting is an essential component of health sciences education; however, opportunities for repeated practice remain limited. Physical Therapy students often have minimal exposure to actual patient handling, while Prosthetics and Orthotics students may have access to individuals with amputations primarily during onsite clinical training. As a result, opportunities for self-directed practice of quadrilateral casting are constrained, particularly in the absence of appropriate model subjects. These limitations pose challenges in the effective teaching of procedural skills. To address this gap, the researchers developed a prototype transfemoral residual limb simulator, the Pelvic–Femoral Learning Model (PFLM).

Methods The model's effectiveness was evaluated using an instructional sheet comprising an "Effectiveness-Survey Questionnaire" and a Measurement Chart. Anatomical structures were sourced online and refined with Blendr 3D, while the residual limb shape was created based on a 3D scan of an actual amputee.

Results The PFLM achieved a passing score. Statistical analysis compared two datasets (Baseline and PO Evaluators' Management) indicating no significant difference and demonstrating measurement consistency. Most participants found the model highly beneficial, noting its close resemblance to an actual patient.

Conclusion: The findings support the hypothesis that the model is an effective learning tool for students. Future improvements could include adding moving mechanical parts to enhance landmark palpation. The PFLM was deemed a valuable, alternative educational resource for PT and PO students.

Key words: PFLM - Pelvic-Femoral Learning Model, QL - Quadrilateral Socket, TF - Transfemoral

In the rehabilitation medicine field, two (2) health care professions were primarily seen coordinating with one another whenever amputees were referred; these being the Physical Therapists (PT)[1], and the Prosthetists or Orthotists (PO)[2]. Students of the aforementioned professions were typically taught the fundamental aspects of their respective careers; for PT it was anatomy, palpation, and bandaging, while PO focused on anatomy, palpation, and casting[3].

Palpation is a technique used in the physical assessment of patients in order to examine specific anatomical structures by means of using the fingers or hands to apply light or firm pressure to identify

Correspondence: Rafael Nathaniel T. Mabasa, CPO
email address: rtmabasa@uerm.edu.ph
College of Allied Rehabilitation Sciences, University of the East Ramon Magsaysay Memorial Medical Center

the size, consistency, texture, location, pain, and tenderness of the body part4. Bandaging is a vital skill for those in the rehabilitation field because the use of bandaging techniques are beneficial for supporting joints, retaining a dressing, as well as aids in supporting limbs and body parts in order to prevent the progression of certain conditions. Successful bandaging depends on choosing the correct product, and good technique, both in stretching the bandage to the correct tension, and ensuring proper overlap between layers[5].

In subjects like anatomy and physiology, which typically benefit from face-to-face laboratory sessions, visual 3D imaging was employed as an alternative learning resource for both PO (Prosthetics and Orthotics) and PT (Physical Therapy) students. However, the scarcity of model patients, particularly transfemoral amputees, posed a significant challenge to the physical practice component of their training. This shortage of real-world physical models limited the availability of tangible learning tools, thereby impacting students' hands-on experience and practical understanding.

The researchers aimed to create a prototype model of a Transfemoral Residual limb, which could be used as an alternative model for the practices of both the Physical Therapy, and Prosthetics and Orthotics students.

Methods

The research proposal was approved by the Ethics Review Committee of the UERM Medical Center – Research Institute for Health Sciences (RIHS) under ERC Code 1444/C/2023/016. The study utilized a prototype development and expert evaluation design, which involved the creation, testing, and assessment of an educational 3D-printed transfemoral residual limb model (PFLM) for use in Physical Therapy (PT) and Prosthetics and Orthotics (PO) training.

The PFLM was initially designed using Blender 3D modeling software. Bone structures were sourced from online anatomical repositories, while the residual limb's external shape was modeled from a 3D scan of an actual transfemoral amputee (Figure 1). The scan was obtained using the Techmed 3D App and the Structure Sensor Pro scanner (Figure 2).

The transfemoral model included the lumbar vertebrae, sacrum, coccyx, iliac crest, ilium, anterior superior iliac spine, pubis ramus, ischial tuberosity, femoral head, femoral shaft, and distal femur (Figure 3). In accordance with ISPO guidelines, the femur was positioned in 9–11° adduction and 5° flexion. After 3D printing, the bones were encased in a hollow shell representing the transfemoral residual limb and embedded in polyurethane (PU) foam, which was removed after curing to recreate realistic anatomical alignment (Figure 4).

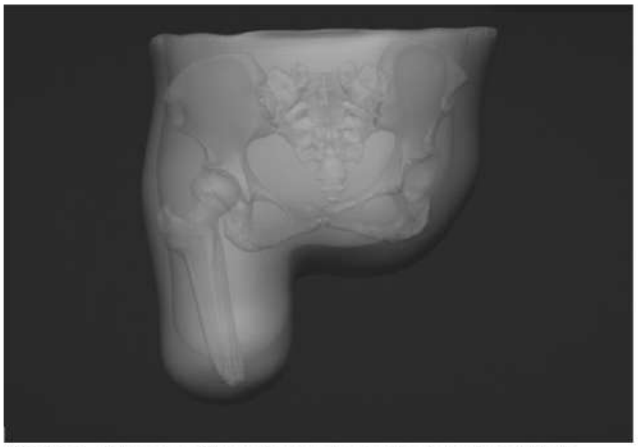

Figure 1. 3D scan of transfemoral amputee's residual limb

Figure 2. Amputee scanning using the scanner structure sensor pro

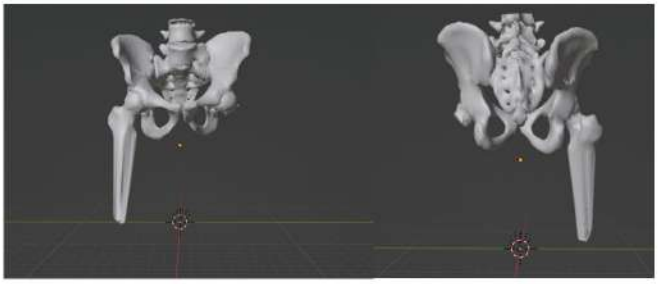

Figure 3. 3D diagrams of bone structure used for PFLM

Figure 4. PFLM finished product.

Participants were selected through purposive sampling, consisting of faculty members from the UERMMMCI CAReS Department. A total of 18 Physical Therapy and 12 Prosthetics and Orthotics professors were invited to evaluate the model.

Effectiveness of the model was assessed using an evaluation survey measuring the feasibility of (1) palpating and identifying transfemoral anatomical landmarks, (2) performing bandaging techniques, and (3) casting the model using a quadrilateral socket design.

Descriptive statistics (frequency distribution and median scores) were used to analyze survey responses. The median was selected as the measure of central tendency due to the small sample size (n = 11). Higher scores approaching the maximum possible value (HPS = 5.00) indicated greater model effectiveness. Survey items were categorized into positive, neutral, or negative attitudes based on the Likert scale. Items rated as positive or neutral were considered acceptable. To determine whether differences between the PO evaluators' casting measurements and baseline measurements were statistically significant, an unpaired t-test was performed.

Results

Results indicate that discrepancies were greatest in angular measurements compared to diameters, circumferences, and lengths. For diameters, the anteroposterior (AP) measurement showed a discrepancy of ±1.14 cm, while the mediolateral (ML) diameter had ±1.55 cm. Among the circumferential measurements, the distal-end circumference showed the smallest discrepancy at ±0.06 cm, whereas the circumference 10 cm below the ischial tuberosity (IT) had the largest difference at ±0.56 cm. For angular measurements, the flexion angle demonstrated the highest discrepancy at ±3.86°, while the adduction angle showed the least at ±0.25.

Review of all landmark measurements, supported by responses to the open-ended questions, suggests a pattern linking measurement accuracy with the model's lack of hip joint mobility. Discrepancies were greatest at proximal landmarks involving the IT, particularly in angular measurements. This supports the inference that difficulty locating the IT—due to the absence of true hip movement—contributed to higher variability. The large flexion-angle discrepancy reinforces this limitation, as the flexion angle also uses the IT as the fulcrum for determining the degree of hip flexion.

Using an unpaired t-test on two datasets (Baseline Measurements and PO Evaluators' Measurements) showed no statistically significant difference between the two sets of measurements (p value 0.98). This means that the PFLM demonstrates stable measurement characteristics during evaluation and casting.

Responses to the open-ended questions further supported the anatomical validity of the PFLM. Most evaluators noted that the tissue consistency and palpable bony prominences resembled those of an actual transfemoral amputee. Based on all survey items, the PFLM received an overall effectiveness score of 3.25/5.00 (65%, Neutral Attitude) for both the Physical Therapy and Prosthetics & Orthotics evaluators. This falls within the acceptable range (2.50–3.40) and constitutes a passing mark. While improvements to the model are warranted, current findings suggest that the PFLM is a viable alternative learning tool for BS Physical Therapy and BS Prosthetics and Orthotics students when practicing transfemoral assessments and procedures.

Discussion

In a field wherein exposure to patients is essential to the overall improvement and confidence of a student,

access to tools and instruments that mimic a person's certain anatomical structure can be greatly beneficial. The use of the Pelvic-Femoral Learning Model may provide students with the opportunity to be familiar with the feeling and likeness of a transfemoral residual limb.

Living in a third-world country, the scarceness of materials and resources is a common problem encountered by learners; an example of which is the lack of 3D printers 42 due to (1) high initial cost, (2) lack of skilled workforce, and (3) lack of regulations that hinders the adaptation of 3D printers in the Philippines which concomitantly affects the efficiency necessary to acquire certain knowledge and skills. In the Philippines, the majority of the functions of 3D printing are found to be used in creating prototypes, which is uncommon. However, with certain fields such as industrial and medicine incorporating the use of 3D printing, awareness surrounding the technology is growing[6]. Despite this, users experience disruptions due to misinformation and a lack of knowledge about how to use 3D printing. Numerous research studies and papers on digital fabrication and 3D printing have noted that a major obstacle to its wider adoption is the lack of appropriate education, training, and skills[7].

The scarcity of educational resources in developing nations poses a barrier to the progress of education. The introduction of 3D printing technology could offer a practical approach to producing educational tools, potentially solving the issue of scarcity. Three-dimensional (3D) printing has seen a marked increase in utilization across various fields in recent years. It has been instrumental in the production of custom-made dosage forms, the advancement of anatomical implants, and the creation of cell-based materials for regenerative purposes, among other various uses[8]. In the context of education, 3D printing has the potential to create customized learning tools, with these being used as models for science classes, tools for mathematics, or even equipment for physical education. This type of technology could be especially beneficial in third-world countries where educational resources are often limited.

Conclusion

This study demonstrates that the Pelvic–Femoral Learning Model (PFLM) is an effective alternative instructional model to actual transfemoral amputees' residual limbs. The model's anatomical accuracy and life-like tissue characteristics support the acquisition of essential clinical skills, including palpation, bandaging, casting, and post-procedural care. The use of the PFLM addresses limitations associated with makeshift training models and reduces the need for live model patients, thereby enhancing the feasibility, consistency, and safety of skills training for undergraduate Physical Therapy and Prosthetics and Orthotics students.

Recommendation

Future studies should explore alternative materials and fabrication techniques to improve model quality and cost-effectiveness. The development of movable anatomical components, particularly allowing controlled hip joint motion, is strongly recommended to enhance anatomical realism and educational utility. Improvements in manpower allocation and scheduling may optimize workflow efficiency in future projects.

Further training in advanced 3D modeling software is recommended to facilitate more accurate anatomical customization. Researchers are also encouraged to investigate cost-efficient software solutions for capturing and refining the appearance of printed bones and model containers, particularly in resource-limited settings. Finally, future research may include congenital anatomical structures to broaden the educational applicability of the model and provide exposure to less common but clinically relevant anatomical variations.

References

1. Colorado Physical Therapy Network. What is the role of a physical therapist? [Internet]. 2019 [cited 2022 Nov 12]. Available from: https://coloradophysicaltherapynetwork.com/what-is-the-role-of-a-physical-therapist/
2. Co JRM, Culaba AB. 3D printing: challenges and opportunities of an emerging disruptive technology. In: Proceedings of the 2019 IEEE 11th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment, and Management (HNICEM); 2019 Nov; Laoag City, Philippines. Piscataway (NJ): IEEE; 2019. p. 1–6. doi:10.1109/HNICEM48295.2019.9073427.
3. Coull AF. Bandages and bandaging techniques for compression therapy [Internet]. Stirling (UK): University of Stirling; MA Healthcare Ltd; [cited 2022 Nov 12]. Available from: https://www.stir.ac.uk/research/hub/publication/892021

4. Infinite Technologies Orthotics and Prosthetics. Taking the next steps: your therapist and orthotist/prosthetist working towards one common goal [Internet]. 2020 [cited 2022 Nov 13]. Available from: https://www.infinitetech.org/taking-the-next-steps-your-therapist-and-orthotist-prosthetist-working-towards-one-common-goal/
5. Jamróz W, Szafraniec J, Kurek M, Jachowicz R. 3D printing in pharmaceutical and medical applications: recent achievements and challenges. Pharm Res 2018;35(9):176. doi:10.1007/s11095-018-2454-x.
6. Johns Hopkins Medicine. Orthotist and prosthetist [Internet] 2019 [cited 2022 Nov 13]. Available from: https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/orthotist-and-prosthetist
7. Mortejo J, Canare F, Rivera C, Cruz C, Robles S, Dizon JR. Awareness level on additive manufacturing (3D printing) technology in the province of Bataan. Bulacan State Univ Res J 2022;25:1–17. doi:10.47789/burdj.mbtcbbgs.20222501.01.
8. Swartz MH, Swartz TH. The physical examination. In: Swartz MH (editor). Textbook of Physical Diagnosis: History and Examination. 8th ed. Philadelphia (PA): Elsevier; 2021. Chapter 6.

Isolation and detection of *Acanthamoeba spp.* in Tadlac Lake in Los Baños, Laguna

Therese A. Suratos[1], Jeune Marc William C. Paclibar[1,3], Lovely Camille S. Sayson[1], Patrick R. Relacion[1,2], Margarette L. De Los Santos[1], Jeremiah Gabrial C. Eleazar[1], Michaela T. Guingab[1], Simon Jorel B. Ngo[1], Kate Yzabhelle M. Ongtangco[1], Samantha Irene S. Razote[1], Richmond D. Sarmiento[1], Bill Ritchie C. Torre[1], Samantha Kary G. Valencia[1]

Abstract

Introduction *Acanthamoeba spp.* are free-living amoebae commonly found in aquatic environments, with pathogenic genotypes capable of causing severe diseases such as acanthamoeba keratitis and granulomatous amoebic encephalitis. Environmental factors, particularly pH, influence their survival and distribution. Tadlac Lake located at Los Baños, Laguna, Philippines is a Class C freshwater body used for aquaculture, recreation, and irrigation. To date, no study has specifically assessed *Acanthamoeba* colonization in Tadlac Lake.

Methods In this study, detection of the presence of *Acanthamoeba spp.* and evaluation of pH as a potential factor influencing their persistence in Tadlac Lake was conducted. One-time sampling was conducted from nine sites of the lake. Surface water samples were collected at a depth of 10–20 cm, filtered through 1.2 µm glass microfiber filters, and cultured on non-nutrient agar plates lawned with live *Escherichia* coli. Plates were incubated at 30°C for 14 days and examined daily under light microscopy, while pH was measured *in situ*.

Results Cyst-like structures resembling amoebae were observed, but these did not exhibit definitive Acanthamoeba morphology under light microscopy. No Acanthamoeba spp. were confirmed and the recorded pH levels ranged from 8.72 to 10.51, exceeding the optimal growth range (7.0–9.0) reported for the organism.

Conclusion Findings of this study suggest alkaline conditions may have inhibited the proliferation and persistence of Acanthamoeba spp. in the lake. These findings highlight pH as a potential limiting factor for Acanthamoeba survival in alkaline freshwater bodies and underscore the importance of integrating physicochemical monitoring into pathogen surveillance frameworks.

Key words: *Acanthamoeba spp, Amoebae, Amoebic encephalitis, Acanthamoeba keratitis, Acanthamoeba cysts*

Freshwater lakes play an important role in both nature and our communities. They serve as sources of drinking water, support agriculture, provide spaces for recreation, and act as habitats for a variety of plants and animals.[1] Lakes naturally host a wide range of aquatic life, including microorganisms, by providing stable conditions and nutrients. However, they are also at risk of colonization from human activities, natural nutrient cycles, and environmental changes.[2] This makes regular monitoring of their water quality essential, both to protect biodiversity and to keep people safe. While most Acanthamoeba strains are harmless, some can cause serious diseases. Acanthamoeba Keratitis (AK) is a painful and potentially blinding infection

Correspondence: Therese A. Suratos, MSMT, RMT
email: trsuratos@uerm.edu.ph
[1]College of Allied Health Professions, University of the East Ramon Magsaysay Medical Center
[2]College of Public Health, University of the Philippines Manila
[3]Laboratory Medicine Division, Philippine Heart Center

of the cornea, often affecting contact lens users but also reported in those who have never worn lenses, while Granulomatous Amoebic Encephalitis (GAE) is a rare but severe brain infection that mainly affects people with weakened immune systems.[3,4] In addition to these risks, *Acanthamoeba spp.* can harbor other harmful microorganisms posing a concern for both environmental and public health.

Tadlac Lake in Los Baños, Laguna, is a unique example of a freshwater volcanic crater lake.[5] Its enclosed setting creates a stable environment, but it can also encourage the growth of microorganisms such as *Acanthamoeba spp.* These amoebae are naturally found in many freshwater and even man-made water systems. They have two life stages: the active trophozoite stage, where they feed and reproduce, and the cyst stage, which is highly resistant to environmental stress and can survive for long periods under unfavorable conditions.

Tadlac Lake is classified as Class C freshwater, which has multiple purposes for aquaculture, recreation, irrigation, and livestock watering.[6,7] Considering direct human interaction with the lake water, it is essential to determine the presence of potentially harmful microorganisms. Factors such as water pH, temperature, and nutrient levels can influence whether *Acanthamoeba* can survive and multiply, so they need to be considered in monitoring studies. Among these parameters pH level of the lake was prioritized in this study due to its documented influence in amoebic growth and survival. This study aimed to establish baseline data on the presence of *Acanthamoeba* spp. in Tadlac Lake by determining whether they occur in its waters, identifying areas where they are most likely to be found, and investigating how water pH may influence their prevalence. The findings are intended to support water monitoring efforts and help safeguard both the ecological health of the lake and the well-being of the communities that depend on it.

Methods

Study Site

Tadlac Lake is situated in Barangay Tadlac, Los Baños, Laguna, Philippines, at approximately 14°09'N and 121°12'E. It is a volcanic crater lake, naturally enclosed and surrounded by a mix of agricultural and residential areas. The lake is classified as Class C under the Department of Environment and Natural Resources' (DENR) water quality standards, which means it is designated for fisheries, aquaculture, recreational water, Class II, agriculture, irrigation, and livestock watering. The enclosed nature of the lake minimizes water exchange with other bodies, potentially influencing water quality and microbial composition. Sampling points were strategically chosen to represent various parts of the lake, including areas near residential zones, agricultural runoff points, and relatively undisturbed sections.

Sample Collection

Water sampling was conducted from nine predetermined sites along the lake's perimeter to account for spatial variation. At each site, five 250 mL surface water samples were collected to improve detection accuracy and represent variability within the site. Sampling was performed at a depth of approximately 10–20 cm using sterile, wide-mouthed polyethylene bottles. Before each collection, bottles were rinsed three times with lake water to minimize contamination from handling. Water was collected by submerging bottles facing upstream to avoid sediment disturbance. Each bottle was immediately capped and labeled with the site number, replicate number, date, and time. Samples were transported at room temperature to the laboratory on the same day to reduce changes in microbial composition prior to processing.[8]

Isolation and Culturing of Acanthamoeba spp.

In the laboratory, 250 mL from each water sample was filtered through a 1.2 µm pore-size glass microfiber filter (Whatman™) using a vacuum filtration unit. This pore size retains protozoa, such as *Acanthamoeba*, while allowing smaller microorganisms and fine particles to pass. Filters were placed sediment side down onto non-nutrient agar (NNA) plates seeded with live *Escherichia coli*, which served as a food source. Plates were sealed with parafilm to prevent desiccation and incubated at 30°C for 14 days. Daily microscopic examinations using a light microscope (Olympus CX23) were performed at 10X and 40X magnifications to monitor the emergence of trophozoites and cysts.

Plates without growth after the incubation period were recorded as negative.[8]

Morphological Identification

Suspected *Acanthamoeba* growth was examined based on established morphological criteria. Trophozoites were identified by their irregular outline, spiny acanthopodia, central nucleus, and prominent contractile vacuole. Cysts were recognized by their double-walled structure, characterized by an outer wrinkled ectocyst and an inner polygonal or star-shaped endocyst. Observations were compared with published reference images for confirmation. When structures appeared ambiguous, cultures were observed over consecutive days to detect morphological transitions consistent with Acanthamoeba development.[9,10]

pH Measurement

The pH of the lake water at each sampling site was measured on-site immediately after collection using a calibrated handheld pH meter. The probe was rinsed with distilled water between readings to prevent cross-contamination. Measurements were recorded to two decimal places and documented with corresponding site and sample information. Immediate in situ measurement was prioritized to avoid potential chemical alterations during transport.

Results

Cyst-like structures of unknown origin on the Whatman™ filters were recorded after 14 days, following the microscopic examination of the culture plates incubated at 30 °C. These structures were consistently observed at multiple sampling sites, specifically: Site A (A-1), Site B (B-1, B-2, B-4), Site C (C-1 to C-4), Site D (D-3 to D-5), and Site E (E-3, E-5). Structures appeared as yellow-brown, spherical to ovoid forms with a distinct double wall, closely resembling the morphology of pollen grains under high power magnification (400x) (Figure 1). Their origin and biological significance remain uncertain, and further analysis is needed to establish their identity.

The pH levels were measured after collecting five samples from each site to ensure a comprehensive analysis of water quality. The results are summarized in Table 1, which displays the pH levels recorded across the various locations, ranging from Site A to Site I. The measured pH levels range from 8.72 to 10.51, indicating alkaline conditions in the water samples. Specifically, Site I recorded the lowest pH level at 8.72, suggesting a slightly less basic environment than the other sites. In contrast, Site A exhibited the highest pH level at 10.51, indicating a more pronounced basicity. These findings are crucial for understanding the water chemistry in these areas and may have implications for aquatic life and overall ecosystem health.

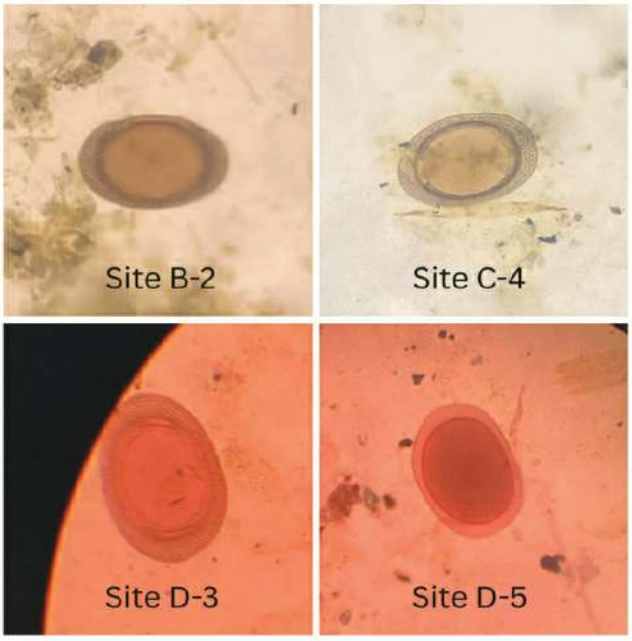

Figure 1. Microscopic photograph of the unidentified structures from the samples collected from Tadlac Lake, incubated at 30°C for 14 days.

Discussion

This study did not confirm the presence of *Acanthamoeba* spp. in water samples collected from Tadlac Lake. Although cyst-like structures were observed in several cultures, they did not exhibit the distinct double-walled morphology—characterized by a wrinkled ectocyst and a polygonal or star-shaped endocyst—that is typically used to identify *Acanthamoeba* spp. according to standard taxonomic descriptions. This suggests that other free-living amoebae or debris may have been present instead.

Table 1. pH levels of Tadlac Lake

Site	pH	GPS Coordinates
A	10.51	14.18450°N, 121.20845°E
B	10.38	14.18452°N, 121.20773°E
C	10.00	14.18463°N, 121.20847°E
D	9.40	14.18477°N, 121.20850°E
E	9.06	14.18032°N, 121.20544°E
F	8.87	14.18105°N, 121.20579°E
G	8.79	14.18183°N, 121.20662°E
H	8.82	14.18093°N, 121.20467°E
I	8.72	14.18471°N, 121.20838°E

A likely explanation for the absence of confirmed isolates is the lake's alkaline water conditions, with measured pH values ranging from 8.72 to 10.51. These values exceed or approach the upper limit of the optimal pH range for *Acanthamoeba* growth (7.0–9.0). Such alkaline conditions can impair the activity of trophozoites, hinder encystation, and reduce survival rates, thereby inhibiting the proliferation of *Acanthamoeba*.

Other environmental factors, such as temperature, dissolved oxygen, turbidity, and nutrient levels, also influence *Acanthamoeba* distribution; however, these factors were not assessed in this study. The unique characteristics of Tadlac Lake, as a volcanic crater lake with an enclosed basin and limited water exchange, may also create physicochemical conditions that are unfavorable for *Acanthamoeba* colonization.

These findings differ from those of Montalbano Di Filippo and colleagues, who successfully isolated free-living amoebae, including *Acanthamoeba* spp., from freshwater sources in Italy, and from Garrido et al., who reported detections from multiple sites along the Marikina River in the Philippines.[11,12] This highlights the influence of water chemistry, local conditions, anthropogenic impacts, and methodological differences, such as sampling depth and culture media. Additionally, temporal variation may account for the absence of *Acanthamoeba*, as seasonal changes in rainfall, temperature, and nutrient influx affect water quality and may influence amoebic presence.

Since this study was limited to a single sampling period and focused exclusively on water samples, it is possible that cysts persisted in sediments, as shown in previous studies where sediments remained positive despite negative results from water samples.

Overall, the alkaline pH of Tadlac Lake (8.72–10.51) likely serves as a limiting factor for *Acanthamoeba* survival. However, without comprehensive data on other physicochemical parameters, the exact cause of their absence cannot be determined. Despite this limitation, the study underscores the necessity of integrating multiple environmental variables, conducting seasonal monitoring, and sampling sediments in future investigations to better understand the ecological factors that influence *Acanthamoeba* occurrence.

Recent research emphasizes the significant global prevalence of *Acanthamoeba* in environmental sources, including water and soil,[13,14] which poses potential public health concerns amid the increasing use of contact lenses.[13,15] The pathogenic T4 genotype, predominantly associated with *Acanthamoeba* keratitis (AK)—a painful and vision-threatening corneal infection among contact lens users—constitutes a major proportion of isolates worldwide.[13,16,17] The warm and humid climate of the Philippines may further favor the persistence of this pathogen.

Beyond its direct pathogenicity, *Acanthamoeba* also acts as a reservoir for various intracellular microorganisms, enhancing its role as a "Trojan horse" pathogen capable of harboring and transmitting other infectious agents.[18,19,20] This dual role emphasizes the organism's ecological and medical importance and highlights the urgent need for continued surveillance, public health awareness, and research on environmental *Acanthamoeba* to mitigate its potential risks to human health.

Limitations

This study has several limitations that should be acknowledged. First, sampling was conducted only once, which restricts the ability to infer temporal variations in *Acanthamoeba* occurrence and the associated physicochemical parameters. Second, only water samples were analyzed, excluding sediments and biofilms that may serve as reservoirs for Acanthamoeba cysts. Previous studies have shown that cysts can persist in sediments even when water

samples test negative, highlighting the importance of sampling the benthic zone. Third, environmental variables such as temperature and turbidity were not recorded or analyzed, limiting the interpretation of potential correlations between *Acanthamoeba* presence and lake conditions. Lastly, the study relied solely on morphological identification without molecular confirmation (e.g., PCR-based genotyping), which may affect the precision of species-level identification.

Recommendations

Future investigations should implement year-round monitoring to capture the dynamics of both the dry and wet seasons. This is important because seasonal fluctuations in rainfall, temperature, and nutrient levels can influence lake chemistry and the occurrence of *Acanthamoeba*. Comprehensive sampling should encompass multiple matrices, such as sediments and biofilms, to gain a better understanding of the persistence and distribution of *Acanthamoeba* cysts within the ecosystem. It is strongly recommended to utilize molecular techniques, including 18S rRNA PCR-based assays, for definitive identification and genotyping of *Acanthamoeba*. Ultimately, integrating *Acanthamoeba* monitoring into local environmental health surveillance programs could provide valuable data for risk assessment and effective management of water quality in natural freshwater systems.

Conclusion

This study provides the first baseline assessment of the occurrence of *Acanthamoeba spp.* in Tadlac Lake, Los Baños, Laguna. No confirmed isolates were found, although cyst-like structures were observed in several cultures. The consistently alkaline pH levels (ranging from 8.72 to 10.51) across the sampling sites likely limited the survival of *Acanthamoeba*, as these pH levels exceed the organism's optimal growth range. These findings highlight how physicochemical parameters, particularly pH, affect the distribution and persistence of free-living amoebae in freshwater environments. Although the absence of *Acanthamoeba* suggests that the current conditions of the lake may be unfavorable for colonization, the limited sampling period and insufficient environmental data prevent us from drawing definitive conclusions about its long-term presence. Given the known role of *Acanthamoeba* as an opportunistic pathogen and a reservoir for other microorganisms, continued surveillance using molecular detection methods, sediment analysis, and seasonal monitoring is recommended. Such multidisciplinary approaches will enhance our understanding of the environmental factors influencing *Acanthamoeba* ecology and will support public health strategies aimed at reducing potential exposure risks in Philippine freshwater systems.

Funding

This research received no external funding.

Conflicts of Interest

The authors have no conflict of interest to declare.

References

1. Spears BM, Hamilton DP, Pan Y, Zhaosheng C, May L. Lake management: is prevention better than cure?. Inland Waters 2022 Jan 2;12(1):173-86.
2. Zhang Y, Zhu H, Li B, Yang G, Wan R. Aquatic ecosystem health assessment of Poyang lake through extension evaluation method. Water 2021 Jan;13(2):211.
3. Vijayakumar R. Isolation, identification of pathogenic Acanthamoeba from drinking and recreational water sources in Saudi Arabia. J Adv Vet Animal Res 2018 Nov 30;5(4):439.
4. Salameh A, Bello N, Becker J, Zangeneh T. Fatal granulomatous amoebic encephalitis caused by Acanthamoeba in a patient with kidney transplant: a case report. In Open Forum Infectious Diseases 2015 Sep 1 2(3): ofv104. Oxford University Press.
5. Brillo BB. Intricacies, challenges and implications: the governance of Tadlac Lake, Baños, Laguna, Philippines. Int J Water 2017;11(4):376-94.
6. Rodil MS, Banaag C, Velasco EJ, Elazegui EP. Water quality and phytoplankton structure and functional classification in Tadlac Lake, Philippines. Biodivers J Biol Divers 2024 Aug 31;25(8).
7. Department of Environment and Natural Resources (2016). Water Quality Guidelines and General Effluent Standards of 2016. https://pab.emb.gov.ph/wp-content/uploads/2017/07/DAO-2016-08-WQG-and-GES.pdf
8. Padua MFFE, Masangkay FR, Alejandro GJD, Milanez GDJ. Detection of Acanthamoeba spp. in groundwater sources in a rural area in the Philippines. J Water Health 2023 Jan 1;21(1):138–46.
9. Centers for Disease Control and Prevention (CDC). About *Acanthamoeba* Infections [Internet]. Acanthamoeba Infections. 2025. Available from: https://www.cdc.gov/acanthamoeba/about/?CDC_AAref_Val=https://www.cdc.gov/parasites/acanthamoeba/

10. Eldeek H, Attia RAH, Attia MM, Nageeb AA. Comparative evaluation of multiple staining techniques for identification of different developmental stages of *Acanthamoeba* and *Naegleria*. J Egyptian Soc Parasitol 2019 Aug 1;49(2):409-22.
11. Montalbano Di Filippo M, Santoro M, Lovreglio P, Monno R, Capolongo C, Calia C, Fumarola L, D'Alfonso R, Berrilli F, Di Cave D. Isolation and molecular characterization of free-living amoebae from different water sources in Italy. Int J Environ Res Public Health 2015 Apr;12(4):3417-27.
12. Garrido K, Ileto A, De Jesus V, Emperador W, Francisco A, Garcia P, Hadap A, Hernandez ME, Lacson JF, Lagudas CR, Padua MF. Occurrence of *Acanthamoeba spp*. in a major river in the Philippines: Impact on water quality and health. J Water Sanit Hyg Dev 2023 Nov 1;13(11):885-92.
13. Hsu TK, Chen JS, Tsai HC, Tao CW, Yang YY, Tseng YC, Kuo YJ, Ji DD, Rathod J, Hsu BM. Efficient nested-PCR-based method development for detection and genotype identification of Acanthamoeba from a small volume of aquatic environmental sample. Sci Rep 2021 Nov 5;11(1):21740.
14. Scruggs BA, Quist TS, Zimmerman MB, Salinas JL, Greiner MA. Risk factors, management, and outcomes of Acanthamoeba keratitis: A retrospective analysis of 110 cases. Am J Ophthalmol Case Rep 2022 Mar 1;25:101372.
15. Rayamajhee B, Subedi D, Won S, Kim J, Vijay A, Tan J, Henriquez FL, Willcox M, Carnt NA. Investigating domestic shower settings as a risk factor for Acanthamoeba keratitis. Water.2020 Dec 11;12(12):3493.
16. Alfarisi MD, Putra IW, Adzuba KK, Paramita LK, Zulkarnaen DA. A Review Article: Clean water contamination as a risk factor for *Acanthamoeba* Keratitis. Green Medical J 2022 Dec 28;4(3):76-83.
17. Nielsen MK, Nielsen K, Hjortdal J, Sørensen UB. Temperature limitation may explain the containment of the trophozoites in the cornea during Acanthamoeba castellanii keratitis. Parasitol Res 2014 Dec;113(12):4349-53.
18. Özcan Aykol SM, Zeybek Z, Kayabas Y, Çevikli S, Keskin NB, Kahraman MH, Çalis H. Effect of *Acanthamoeba spp*. cell-free supernatants on some bacterial pathogens. J Basic Microbiol 2025 Mar;65(3):e2400537.
19. Ling X, Gu X, Shen Y, Fu C, Zhou Y, Yin Y, Gao Y, Zhu Y, Lou Y, Zheng M. Comparative genomic analysis of Acanthamoeba from different sources and horizontal transfer events of antimicrobial resistance genes. Msphere 2024 Oct 29;9(10):e00548-24.
20. Pinto LF, Andriolo BN, Hofling-Lima AL, Freitas D. The role of Acanthamoeba spp. in biofilm communities: a systematic review. Parasitol Res 2021 Aug;120(8):2717-29.

Knowledge, attitudes, and practices of senior high school students in Manila city on Human Papillomavirus (HPV) infection and vaccination: a descriptive cross-sectional study

Japheth Mye S. Dinglasan[1], Joyce Belle S. Dinglasan[1], Angelica D. Dizon[1], Kirsten Danielle R. Doctora[1], Tricia Gale A. Domail[1], Shane Clarence C. Domingo[1], Andrei P. Duhaylungsod[1], Paula Mae A. Dychitan[1], Alexandrina E. Eboña[1], Charina C. Ebreo[1], Jan Rey S. Escano[1], Jasmine Lianne B. Esguerra[1], Marjorie M. Espedido[1], Arienne Therese P. Evangelista[1], Kimberly F. Eviza[1], Jose Ronilo G. Juangco, MD, MPH[2], Maribel Emma Co-Hidalgo, MD, MSPH[3]

Abstract

Introduction Human papillomavirus (HPV) is a prevalent sexually transmitted infection linked to cervical and anal cancers. Although there are many studies worldwide on knowledge, attitudes, and practices (KAP) regarding HPV, research in the Philippines is still limited. This study assessed the knowledge, attitudes, and practices (KAP) of senior high school students in Manila regarding HPV infection and vaccination.

Methods A descriptive cross-sectional survey was conducted among 345 senior high school students from a private tertiary school in Manila using a self-administered questionnaire. Frequencies and percentages summarized demographic characteristics and KAP responses.

Results Most respondents demonstrated good knowledge of HPV, with 86.4% recognizing its link to cervical and anal cancer and 86% identifying it as a common sexually transmitted infection. Attitudes toward vaccination were largely positive: 73% expressed willingness to be vaccinated, and 87.8% considered the vaccine safe. However, only 2.6% had been vaccinated. Limited discussions about HPV, misconceptions about gender susceptibility, and low awareness of local vaccine availability contributed to poor uptake. The internet was the primary information source (84.9%).

Conclusion Although knowledge and attitudes were favorable, vaccination rates remained extremely low due to access gaps, misconceptions, and limited communication. Strengthening school-based education and improving vaccine accessibility are essential to enhance HPV prevention among adolescents.

Key words: Cervical cancer, human papillomavirus HPV, HPV infection, vaccination

The reported incidence of Human Papillomavirus (HPV) infection among Filipino women is 9.2%, with HPV types 16 and 18 present in 93.8% of cervical squamous cell carcinoma and 90.9% of cervical adenocarcinoma cases, and despite the HPV vaccine being included in the National Immunization Program since 2015, vaccination rates remain low, raising concerns in light of the World Health Organization's goal to vaccinate 90% of girls by age 15 by 2030[1]. HPV infections are a major factor in the development of invasive cervical cancer and are also linked to several other anogenital cancers, including those of the vulva, vagina, anus, and penis[2]. The significant risk factors

Correspondence:
Kimberly F. Eviza
email: evizak9253@uerm.edu.ph
[1]College of Medicine, University of the East Ramon Magsaysay Memorial Medical Center, Inc.,
[2]Department of Preventive and Community Medicine, University of the East Ramon Magsaysay Memorial Medical Center, Inc.
[3]Department of Obstetrics and Gynecology, University of the East Ramon Magsaysay Memorial Medical Center, Inc.

for HPV infection include having sexual intercourse at a young age (≤ 15), multiple pregnancies, a higher number of sexual partners, contraceptive use, smoking and tobacco chewing, and marriage at an early age[3]. Cervical cancer is the second most common cancer among women in the Philippines, and although screening can effectively reduce its incidence, low utilization stems from a lack of education; therefore, improving the authors' knowledge about HPV, cervical cancer, and the benefits, costs, and procedures of screening and vaccination is essential[4].

The World Health Organization (WHO) recommends the Knowledge, Attitudes, and Practices (KAP) framework for assessing factors related to HPV vaccination. According to the WHO, KAP survey data can help identify areas such as knowledge gaps, cultural beliefs, and behavioral patterns that can enhance understanding and support HPV vaccination, or present challenges and barriers to its adoption[5]. A local study found that while most male and female students were willing to get vaccinated, they lacked knowledge about the infection and the vaccine, with the financial cost a significant barrier. Further research is needed to assess acceptance across genders[6].

Currently, HPV infection is considered one of the most prevalent sexually transmitted infections (STIs)[7]. Despite extensive international literature on knowledge, attitudes, and practices (KAP) related to human papillomavirus (HPV) among adolescents and young adults, there is a paucity of Philippine-based studies addressing this domain. Moreover, existing research in this area primarily focuses on other populations, particularly healthcare professionals, with limited attention to adolescents and students. To address this gap, it is crucial to investigate the perspectives of adolescents, as they are at greater risk of acquiring HPV infection. The primary objective of this study is to determine the knowledge, attitude, and practices regarding HPV infection and vaccination of senior high school students in Manila City in August 2024.

Methods

The research design used in the study was descriptive cross-sectional research, and ethical approval was sought from the UERMMMCI Research Institute for Health Sciences' Ethics Review Committee (RIHS ERC) and the Office of Research Coordination of the partner tertiary school. The respondents completed a self-administered questionnaire.

The study was conducted at a coed private tertiary school in Manila City, with a diverse student population of both males and females, representing various religions, senior high school academic strands and socioeconomic backgrounds. Participant recruitment and data collection were done last August 7, 2024.

The study sample consisted of 345 senior high school students from a private tertiary school in Manila City, officially enrolled for the school year 2024-2025, aged 16 to 18 years. Convenience sampling was used to select participants. Researchers obtained formal authorization from the school to execute the study and recruited students who were available.

The variables in the study are the demographic characteristics of senior high school students in Manila City, including age, sex, relationship status, religion, academic strand, and monthly family income. Additionally, the study assessed participants' knowledge of HPV infection and vaccination, including transmission, prevention, and vaccine accessibility. The study also examined attitudes toward HPV vaccination, including beliefs about its necessity and safety, as well as willingness to be vaccinated. Lastly, the study explored practices related to HPV vaccination status, sexual activity, and discussions about HPV infection and vaccination with peers or parents.

The data were collected through a self-administered questionnaire created by the researchers. The questionnaire is divided into sections on sociodemographic characteristics and knowledge, attitudes, and practices (KAP) regarding HPV infection and vaccination. The sociodemographic data included direct questions about age, sex, relationship status, religion, academic strand, and family income. The knowledge section measured the participants' understanding of HPV infection, transmission, and prevention through vaccination, using yes/no questions that have been adapted from existing KAP studies on HPV and cervical cancer screening. Attitudes were assessed by examining the participants' beliefs about the relationship between HPV and cancer, the safety of the HPV vaccine, and their willingness to get vaccinated. Lastly, practices were measured by asking about the participants' HPV vaccination status, sexual behaviors, and the

extent to which they discuss HPV with their peers or family. The sources of information on HPV were also identified to understand the channels through which students acquire knowledge about the infection and vaccination.

The study recognizes possible sources of bias and endeavors to reduce them. First, there is the risk of social desirability bias, particularly in the practices section, where participants may feel the need to provide socially acceptable answers regarding their sexual activity. To minimize this bias, the researchers emphasized the anonymity and confidentiality of all responses. Second, the use of convenience sampling introduced selection bias, as the sample may not fully represent the entire population of senior high school students in Manila City. However, this was chosen for its ease of access, but it limited the generalizability of the results. Lastly, there is a risk of information bias if participants misinterpreted or misunderstood the questionnaire, particularly regarding technical terms related to HPV infection and vaccination. To address this, the researchers personally explained the survey process and clarified any questions that were confusing. Additionally, the questionnaire was designed to be simple and easy to understand, reducing the likelihood of misinterpretation. These efforts aimed to reduce bias and ensure the accuracy and reliability of the collected data.

The sample size was determined based on proportions reported in a previously published study. The reference study reported proportions of respondents who were aware of the availability of a vaccine for the prevention of cervical cancer (92.4%), expressed a positive attitude reflected by willingness to receive HPV vaccination (88.0%), and completed the HPV vaccine regimen (29.4%). Using these estimates, sample sizes were calculated separately for the knowledge, attitudes, and practices domains. The formula for estimating a population proportion was applied, yielding required sample sizes of 108, 163, and 319 participants for the knowledge, attitudes, and practices domains, respectively. Accordingly, a minimum sample size of 319 students was required to achieve a 95% confidence level and 80% statistical power.

Frequencies and percentages were used to present demographic characteristics (age, sex, relationship status, religion, strand, and monthly family income), knowledge levels, sources of information, attitudes, reasons for not getting vaccinated, and practices related to HPV vaccination and protective sexual behaviors.

Results

The sociodemographic characteristics of the participants are summarized in Table 1. Of the 345 senior high school students who completed the survey, 59.15% were females, 98.26% were single, and 67.54% were aged 17. Most were Roman Catholics (76.81%), from the STEM strand (53.91%), and had family incomes ranging from Php50,000 to Php100,000 (33.62%).

Table 2 presents the participants' knowledge of HPV. The majority agreed that HPV can lead to cervical/anal cancer (86.4%) and that HPV is a common sexually transmitted infection (86%). In contrast, the majority disagreed that only females can be infected with HPV (91.9%). Most participants agreed that vaccines for HPV can prevent the development of cervical/anal cancer (62.3%). As shown in Figure 1, the most common source of knowledge about HPV and HPV vaccination was the internet (Google, social media, etc.), as reported by 293 respondents. Among the 345 respondents, the majority (82.3%) were unaware of the accessibility of HPV vaccination within their community or school.

Table 3 presents the respondents' attitudes toward HPV. The majority believed that HPV can lead to cervical/anal cancer. A total of 313 participants supported HPV vaccination for young women, while 276 supported vaccination for young men. Furthermore, 303 respondents perceived anti-HPV vaccines as safe, and 252 expressed willingness to receive the vaccine. The leading reason cited for not receiving the HPV vaccine was concern about pain during inoculation (78.6%; Figure 2).

Table 4 presents the respondents' practices and behaviors regarding HPV. A total of 86.1% of the participants do not engage in sexual activities. Based on the table, 60.4% were in a monogamous relationship, and 62.5% used condoms during sex. Out of 345 respondents, only 9 were vaccinated against HPV. Most of the participants did not discuss HPV infections and vaccination with peers or parents, and the majority did not receive any information about HPV through their school.

Table 1. Socio-demographic profile of the participants (n = 345)

Characteristics	Frequency (n)	Percentage (%)
Age		
16	63	18.26
17	233	67.54
18	49	14.20
Sex		
Female	204	59.13
Male	141	40.87
Relationship Status		
Single	339	98.26
Living with a sexual partner (cohabiting)	6	1.74
Religion		
Roman Catholic	265	76.81
Iglesia ni Cristo	19	5.51
Muslim	8	2.32
Born Again Christian	29	8.41
Baptist	6	1.74
Others	18	5.22
Strand		
STEM	186	53.91
HUMSS	58	16.81
ABM	51	14.78
TECH-VOC	37	10.72
GAS	13	3.77
Monthly Income of the Family		
>100,000	54	15.65
50,000 - 100,000	116	33.62
25,000 - 50,000	99	28.70
10,000 - 25,000	53	15.36
<10,000	23	6.67

Table 2. Knowledge of the participants on HPV infection and vaccination (n = 345).

KNOWLEDGE				
Questions	**Frequency (n)**		**Percentage (%)**	
	Correct	**Incorrect**	**Correct**	**Incorrect**
Human papillomavirus (HPV) infection can lead to cervical/anal cancer.	298	47	86.4	13.6
HPV is a common sexually transmitted infection.	297	48	86	14
Only females can be infected with HPV.	317	28	91.9	8.1
Vaccines for HPV cannot prevent the development of cervical/anal cancer.	215	130	62.3	37.7
Is HPV vaccination readily accessible to you within your community or school?	61	284	17.7	82.3

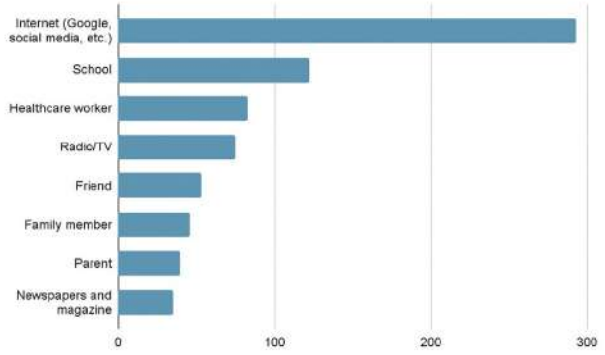

Figure 1. Sources of knowledge of HPV and HPV vaccination

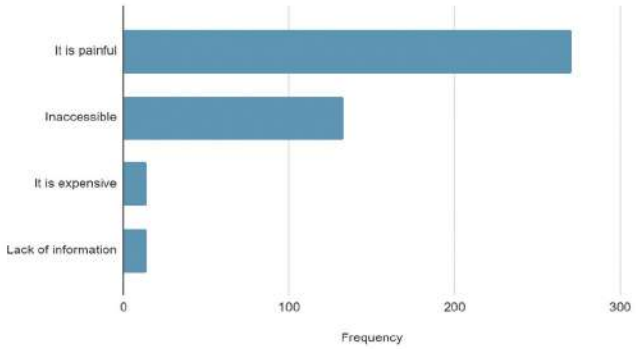

Figure 2. Reasons for not getting the HPV vaccine

Table 3. Attitude of the participants on HPV infection and vaccination (n = 345)

ATTITUDE				
Questions	**Frequency (n)**		**Percentage (%)**	
	Good	**Poor**	**Good**	**Poor**
I believe young women should be vaccinated for HPV.	313	32	90.7	9.3
I believe that human papillomavirus (HPV) can lead to cervical/anal cancer.	311	34	90.1	9.9
I believe that the anti-HPV vaccine is safe.	303	42	87.8	12.2
I believe young men should not be vaccinated for HPV.	276	69	80	20
Are you willing to avail the vaccine for HPV?	252	93	73	27

Table 4. Practices of the participants on HPV infection and vaccination (n = 345).

PRACTICES				
Questions	**Frequency (n)**		**Percentage (%)**	
	Yes	**No**	**Yes**	**No**
Have you been vaccinated against HPV?	9	336	2.6	97.4
Are you sexually active?	48	297	13.9	86.1
If yes, have you had more than one sex partner?	19	29	39.6	60.4
Do you use condoms during sex?	30	18	62.5	37.5
Do you discuss HPV infection and vaccination with your peers or parents?	32	313	9.3	90.7
Have you received any information about HPV infection and vaccination through your school?	44	301	12.8	87.2

Discussion

The study showed that majority of the subjects (86.4%) were knowledgeable that HPV infection could lead to cervical/anal cancer. The existing literature presented conflicting results on this matter. While some studies showed that the majority of subjects were aware that HPV causes cervical cancer, other studies showed that only a few subjects are aware of this[8,9,10,11]. The differences may be linked to cultural and religious barriers, which are known to influence awareness and education on cervical cancer in many Asian countries[11]. Differences in educational attainment, especially between developing and developed countries, may also play a significant role. In developing countries, mothers often serve as the primary source of health information for their daughters, and limited education can lead to gaps in knowledge about HPV. Such differences can also be explained by better education and greater access to formal healthcare resources in developed countries, which typically leads to a narrower gap in HPV-related understanding[10].

The majority of respondents (86%) correctly identified HPV as a common sexually transmitted infection, suggesting a generally adequate level of awareness among the study population. This finding is consistent with a previous study identifying HPV as the most prevalent sexually transmitted infection and a significant contributor to the burden of disease, including anogenital warts, recurrent respiratory papillomatosis, and cancers such as cervical, anal, and oropharyngeal malignancies.[12] Most participants (91.9%) recognized that HPV infection is not limited to females, indicating a high level of awareness that HPV affects individuals of all genders. This finding is consistent with existing evidence demonstrating the widespread impact of HPV across populations, with approximately 80% of sexually active men and women acquiring HPV at least once in their lifetime, and some experiencing multiple infections.[13]

The majority of respondents (62.3%) correctly disagreed with the notion that cervical and anal cancers cannot be prevented by HPV vaccination. This finding aligns with existing research, which highlights the effectiveness of HPV vaccination in significantly reducing the risk of these cancers.[14] Additionally, one study found that 75% of participants recognized HPV vaccination as a preventive measure, with 51.8% specifically acknowledging its role in preventing HPV transmission.[14]

The majority of information about HPV and HPV vaccination was sourced from the Internet, including Google and social media (84.9%), underscoring the crucial role of digital platforms in disseminating health and vaccine-related information. In contrast, another study found that television was the primary source of information for 75% of respondents. Another investigation highlighted that, among adolescents aged 10-19, schools (51.6%) and health professionals (22.6%) were the main sources of knowledge. Furthermore, acquiring information about the HPV vaccine online was linked to greater knowledge and more positive normative beliefs. Increased media coverage and diverse sources of HPV information—including media outlets, social networks, and healthcare professionals—were positively associated with HPV knowledge.[16,17]

Most participants (82.3%) were unaware that HPV vaccination is readily accessible within their community or school. This finding is consistent with data from studies on young adolescents, which have shown that awareness of HPV vaccination remains low in both rural and urban communities. This lack of awareness may be attributed to limited information provided to both teenagers and their parents about HPV prevention and vaccination programs18 . The limited availability of the HPV vaccine in many health centers, even in areas where it is intended to be accessible, may contribute to the low awareness of its availability.

When asked about offering the HPV vaccine to both males and females, the majority of respondents agreed that young women should be vaccinated (90.7%) and also supported vaccinating young men (80%). However, related literature presents varied findings. One study reported that 61.7% of university students in health-related fields and 68.8% in non-health fields believed that HPV vaccination should be limited to women. Another study identified that the primary reasons parents did not vaccinate their sons were the lack of a healthcare provider recommendation and unawareness that the vaccine is available for boys. This lack of awareness is often attributed to the initial focus of HPV vaccination on protecting women against cervical cancer. Nonetheless, recent studies indicate an increasing prevalence of HPV among men, particularly those aged 15-19, prompting global efforts

to include males in vaccination programs and promote gender-neutral vaccines.[21,22]

Among respondents, 87.8% perceived the anti-HPV vaccine as safe, and 73% expressed willingness to receive it. These findings are consistent with a study among adolescents aged 13, 14, and 16 years, in which 86.6% reported interest in HPV vaccination.[23] Similarly, a study conducted among girls aged 18–19 years found that, among those who were pro-vaccine, all participants (100%) were willing to be vaccinated.[24]

The primary reason 78.6% of respondents did not receive the HPV vaccine is the pain of the injection. This is parallel with findings from a study in which pain and cost (33.3% each) were the two main reasons students would not recommend the vaccine[6]. Another study revealed that at the individual level, personal perceptions of the cost of HPV vaccination, along with its safety and efficacy, are among the barriers to implementing HPV vaccination in low- and middle-income countries, including the Philippines[25].

Although most respondents are willing to be vaccinated and perceive the vaccine as safe, a significant majority remain unvaccinated (97.4%). These findings are consistent with multiple studies that also reported low HPV vaccination rates, often due to concerns about pain during administration (78.6%). However, another study identified cost as a primary barrier to vaccination. The persistently low vaccination rates highlight the inadequacy of current health initiatives. Present data indicate that only 23% of girls aged 15 and below have received the first dose, and just 5% have completed the full vaccine series, compared to the WHO target of 90% coverage. These results underscore the urgent need to address the factors contributing to suboptimal vaccination rates.

Eighty-six percent of the respondents stated not engaging in sexual activities, but out of 48 respondents who are involved in sexual relations, 29 (60%) have only one sex partner, and 30 (62.5%) use condoms. There were more sexually active students who practice safe sex, which has a positive impact on preventing the transmission of HPV. This finding that the majority have not engaged in sexual intercourse aligns with local study, 85.48%, of respondents reported not being sexually active[27]. The study did not gather information about the respondents' religion, which could be a relevant factor to consider. However, the results regarding condom use and the number of sexual partners contradicted it, reporting lower condom use and a greater prevalence of individuals with more than one sexual partner[27].

Of the 345 respondents, only 32 (9%) reported discussing HPV infection and vaccination with peers or parents. This may be attributed to communication barriers and feelings of embarrassment when discussing sexually transmitted infections with parents, as well as discomfort in addressing reproductive and sexual health concerns with peers.[28] Conversely, evidence suggests that parent–child discussions about sexual health can promote safer sexual practices, particularly condom use.[29] These findings indicate that encouraging open communication about HPV between parents and adolescents may support improved preventive behaviors.

The majority of participants (87.2%) reported that they had not received information about HPV infection and vaccination from their school. This appears inconsistent with the finding that 35.4% identified school as a source of HPV-related knowledge. This discrepancy may be attributable to response bias, which could have led some respondents to provide inaccurate or socially desirable answers.[30] These findings contrast with those of a related study in which most respondents identified school as their primary source of HPV information.[31] Furthermore, evidence from a study conducted in Hong Kong demonstrated that school-based HPV education programs significantly improve vaccine acceptance among students.[32] Collectively, these findings underscore the important role of schools in delivering accurate and effective HPV education.

Conclusion

This study shows that senior high school students in Manila generally have good knowledge of HPV and positive attitudes toward vaccination; however, this did not translate into actual uptake, with vaccination rates remaining extremely low. Misconceptions, limited awareness of vaccine accessibility, and minimal discussions with parents, peers, and schools contribute to this gap. Strengthening structured HPV education and access is essential to improving preventive behaviors among adolescents.

Recommendations

Based on the study's findings, the researchers recommend that public health campaigns target

both males and females equally, addressing the misconception that only females need the HPV vaccine. Although most respondents had positive attitudes towards vaccination, vaccination rates were low due to concerns about pain and perceived inaccessibility. Given this, educational efforts should focus on alleviating these concerns by providing clear information about the vaccination process and managing expectations regarding side effects. Governments and healthcare providers should improve vaccine accessibility by offering it in schools and community health centers. Since discussions about HPV and vaccination with peers, parents, and schools were limited, schools and healthcare professionals need to encourage open conversations about HPV and sexual health, both in classroom settings and at home.

AI Disclosure Statement

Sections of this manuscript, including grammar refinement, rewriting, and clarity enhancement, were assisted by AI-based writing tools Grammarly and QuillBot. These tools were used to improve readability, grammar, and coherence, but did not generate the study's data, analysis, or conclusions. All interpretations, final content decisions, and revisions were made by the authors.

References

1. Lintao RCV, Cando LFT, Perias GAS, Tantengco OAG, Tabios IKB, Velayo CL, de Paz-Silava SLM. Current status of human papillomavirus infection and cervical cancer in the Philippines. Front Med (Lausanne) 2022; 9: 929062. doi:10.3389/fmed.2022.929062.
2. de Sanjosé S, Bruni L, Alemany L. Role of human papillomavirus in genital cancers other than cervical cancer and anal cancers. La Presse Med 2014 Dec;43(12 Pt 2):e423–8. doi:10.1016/j.lpm.2014.10.001.
3. Khamisy-Farah R, Adawi M, Jeries-Ghantous H, Bornstein J, Farah R, Bragazzi NL, et al. Knowledge of human papillomavirus (HPV), attitudes and practices towards anti-HPV vaccination among Israeli pediatricians, gynecologists, and internal medicine doctors: development and validation of an ad hoc questionnaire. Vaccines (Basel) 2019;7(4):157. doi:10.3390/vaccines7040157.
4. Imoto A, Honda S, Llamas-Clark EF. Human papillomavirus and cervical cancer knowledge, perceptions, and screening behavior: a cross-sectional community-based survey in rural Philippines. Asian Pac J Cancer Prev 2020; 21(11):3145–51. doi:10.31557/APJCP.2020.21.11.3145.
5. World Health Organization. HPV vaccine communication: special considerations for a unique vaccine. Geneva: WHO; 2016. Available from: https://apps.who.int/iris/bitstream/handle/10665/250279/WHO-IVB-16.02-eng.pdf
6. De Guzman BJ, et al. Knowledge, attitude, and practices of female fourth-year high school students regarding cervical cancer vaccine: a descriptive study. Philip Scie J 2011. Available from: https://www.herdin.ph/index.php?view=research&cid=46899
7. World Health Organization. Human papillomavirus and cancer [Internet] Geneva: WHO; 2023 [cited 2023 Nov 10]. Available from: https://www.who.int/news-room/fact-sheets/detail/human-papilloma-virus-and-cancer
8. Likitdee N, Kietpeerakool C, Chumworathayi B, Temtanakitpaisan A, Aue-Aungkul A, Nhokaew W, Jampathong N. Knowledge and attitude toward human papillomavirus infection and vaccination among Thai women: a nationwide social media survey. Asian Pac J Cancer Prev 2020;21(10):2895–902.
9. Wheldon CW, Krakow M, Thompson EL, Moser RP. National trends in human papillomavirus awareness and knowledge of human papillomavirus-related cancers. Am J Prev Med 2019;56(4):e117–25.
10. Ahlawat P, Batra N, Sharma P, Kumar S, Kumar A. Knowledge and attitude of adolescent girls and their mothers regarding cervical cancer: a community-based cross-sectional study. J Midlife Health 2018;9(3):145–9.
11. Kwan TT, Chan KK, Yip AM, et al. Acceptability of human papillomavirus vaccination among Chinese women: concerns and implications. BJOG 2009;116(4):501–10.
12. Dunne EF, Park IU. HPV and HPV-associated diseases. Infect Dis Clin North Am 2013;27(4):765–78.
13. Milano G, Guarducci G, Nante N, Montomoli E, Manini I. Human papillomavirus epidemiology and prevention: is there still a gender gap? Vaccines (Basel) 2023;11(6):1060. doi:10.3390/vaccines11061060.
14. Li C, Hall TG, Hall JJ, He WQ. Effectiveness of quadrivalent HPV vaccination in reducing vaccine-type and non-vaccine-type high-risk HPV infection. Epidemiol Infect 2023;151:e6. doi:10.1017/S0950268823000038.
15. Pennella RA, Ayers KA, Brandt HM. Understanding how adolescents think about the HPV vaccine. Vaccines (Basel) 2020;8(4):693. doi:10.3390/vaccines8040693.
16. Araújo S, Azevedo C, Lima A, et al. Knowledge and acceptability of the HPV vaccine among HPV-vaccinated and unvaccinated adolescents in the Western Amazon. Rev Bras Epidemiol 2023;26:e230017.
17. Rosen BL, Shew ML, Zimet GD, Ding L, Mullins TL, Kahn JA. Human papillomavirus vaccine sources of information and adolescents' knowledge and perceptions. Glob Pediatr Health 2017;4:2333794X17743405.
18. Thanasas I, Lavranos G, Gkogkou P, Paraskevis D. Understanding of young adolescents about HPV infection: how health education can improve vaccination rate. J Cancer Educ 2020;35(5):850–9.
19. Yilmazel G, Duman NB. Knowledge, attitudes, and beliefs about cervical cancer and human papillomavirus vaccination with related factors in Turkish university students. Asian Pac J Cancer Prev 2014;15(8):3699–704.

20. Gilkey MB, Moss JL, McRee AL, Brewer NT. Do correlates of HPV vaccine initiation differ between adolescent boys and girls? Vaccine 2012;30(41):5928–34.
21. Bogaards JA, Wallinga J, Brakenhoff RH, Meijer CJLM, Berkhof J. Direct benefit of vaccinating boys along with girls against oncogenic human papillomavirus: Bayesian evidence synthesis. BMJ 2015;350:h2016.
22. Bruni L, Albero G, Rowley J, Alemany L, Arbyn M, Giuliano AR, et al. Global and regional estimates of genital human papillomavirus prevalence among men: a systematic review and meta-analysis. Lancet Glob Health2023;11(9):e1345–62. doi:10.1016/S2214-109X(23)00305-4.
23. Jalani FFM, Rani MDM, Isahak I, Aris SM, Roslan N. Knowledge, attitude, and practice of human papillomavirus vaccination among secondary school students in rural areas of Negeri Sembilan, Malaysia. Int J Collab Res Intern Med Public Health 2016;8(6):420–34.
24. Iova CF, Badau D, Daina MD, Suteu CL, Daina LG. Evaluation of the knowledge and attitude of adolescents regarding HPV infection, HPV vaccination, and cervical cancer in northwest Romania. Patient Prefer Adherence 2023;17:2249–62.
25. Ver AT, Notarte KI, Velasco JV, Buac KM, Nazareno J, Lozanes JA, et al. Barriers to implementing human papillomavirus vaccination programs in low- and middle-income countries in the Asia-Pacific: a systematic review. Asia Pac J Clin Oncol 2021;17(6):530–45.
26. Sypien P, Zielonka TM. Evaluation of Polish adolescents' knowledge about human papillomavirus and vaccines. J Adolesc Young Adult Oncol 2023;12(3):376–82. doi:10.1089/jayao.2022.0054.
27. Dalman JT. Sexual risk behaviours and practices among adolescents in an urban community. Asian J Health. 2015 Jan;5:204–. Accessed 2024 Dec 16. Available from: Gale OneFile: Health and Medicine.
28. Ayalew M, Mengistie B, Semahegn A. Adolescent–parent communication on sexual and reproductive health issues among high school students in Dire Dawa, Eastern Ethiopia: a cross-sectional study. Reprod Health 2014;11:77.
29. Widman L, Choukas-Bradley S, Noar SM, Nesi J, Garrett K. Parent–adolescent sexual communication and adolescent safer sex behavior: a meta-analysis. JAMA Pediatr 2016;170(1):52–61.
30. Bogner K, Landrock U. Response biases in standardized surveys. GESIS Survey Guidelines. 2016. Available from: https://doi.org/10.15465/gesis-sg_en_016
31. Oliveira MSF, Sorpreso ICE, Zuchelo LTS, Silva ATM, Gomes JM, Silva BKR, et al. Knowledge and acceptability of HPV vaccine among vaccinated and unvaccinated adolescents in the Western Amazon. Rev Assoc Med Bras 2020.
32. Kwan TT, Tam KF, Lee PW, Chan KK, Ngan HY. Effect of school-based cervical cancer education on perceptions toward human papillomavirus vaccination among Hong Kong Chinese adolescent girls. Patient Educ Couns 2011;84(1):118–22.

Instructions to Authors

Aim and Scope

The UERMMMCI Health Sciences Journal is a peer-reviewed journal published twice a year by the University of the East Ramon Magsaysay Memorial Medical Center Research Institute for Health Sciences. It publishes original articles, reviews, systematic reviews, meta-analyses, case reports and editorials written by the faculty, trainees, students and personnel of the Medical Center.

Style of Papers

All contributions should be written in English. Papers should be written to be intelligible to the professional reader who is not a specialist in the field. The editor and his staff reserve the right to modify manuscripts to eliminate ambiguity and repetitions, and to improve communication between author and reader. If extensive alterations are required, the manuscripts will be returned to the author for revision. Therefore, to minimize delay in publication, manuscripts should be submitted in accordance with the instructions detailed herein. The author may refer to the *Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals* 2025 available at www.icmje.org for additional guidance. The editor will not be held responsible for views expressed in this journal.

Submission of Manuscript

A copy of the manuscript, including tables and figures, should be submitted to the editor. The manuscript should be typed on short bond paper, in a single column, double-spaced all throughout, using Times New Roman or Arial 12. All pages, starting from the title page should have page numbers on the lower right-hand corner. Tables, figures and illustrations should be in separate sheets (**not embedded in the text**). This should be accompanied by a cover letter containing the following: (1) corresponding author with complete contact details; (2) signed declaration by all authors of their involvement and willingness to take public responsibility for the paper's contents; (3)ethics approval when applicable; (4) declaration that the paper has not been published and is not under consideration for publication in another journal; (5) declaration of support/funding when applicable; and (6) declaration of conflict of interest. To facilitate revision of the manuscript, the editor requires submission of an electronic copy in Microsoft Word aside from the printed copy.

Tables and figures and their legends should be submitted as a separate Word file. Photographs should be submitted as a separate jpeg file.

a. Title page, list of authors, corresponding author

The title should be as concise and informative as possible and should contain all key words to facilitate indexing and information retrieval. This should be followed by the list of authors' names to be written as follows: first name, middle initial, family name and highest academic degree. The sequence of names should be agreed upon by the authors. The department or institution of each of the authors should also be provided. Only those qualified based on the *Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals* 2025 should be listed as authors. The contact details (affiliation, address, email address, contact number) of the corresponding author should be provided. The corresponding author should be a regular faculty/staff of the Medical Center.

b. Abstract

This should be a concise structured summary consisting of the Introduction, Methods, Results and Conclusion. It should be no more than **300 words** and include the purpose, basic procedures, main findings and principal conclusions of the investigation. New and important information should be emphasized.

c. Introduction

This should contain a summary of the rationale and objectives of the study and provide an outline of pertinent background material. It should not contain either results or conclusions.

d. Methods

This should adequately describe the study design, population, selection process, randomization, blinding, study procedures, data collected, and statistical methods used in data analysis.

In general, the section should include only information that was available at the time the plan or protocol for the study was being written; all information obtained during the study belongs in the Results section.

The Methods section should include a statement indicating that the research was approved by an independent local, regional or national review body (e.g., ethics committee, institutional review board).

e. Results

This should be presented in logical sequence in the text, tables, and figures, avoiding repetitive presentation of the same data. Measurements should be in International System (SI) units. This section should not include material appropriately belonging to the discussion. Results must be statistically analyzed when appropriate.

Do not repeat all the data in the tables or figures in the text; emphasize or summarize only the most important observations. Provide data on all primary and secondary outcomes identified in the Methods section.

f. Discussion

It is useful to begin the discussion by briefly summarizing the main findings, and explore possible mechanisms or explanations for these findings. Emphasize the new and important aspects of your study and put your findings in the context of the totality of the relevant evidence. State the limitations of your study, and explore the implications of your findings for future research and for clinical practice or policy. Discuss the influence or association of variables, such as sex and/or gender, on your findings, where appropriate, and the limitations of the data. Do not repeat in detail data or other information given in other parts of the manuscript, such as in the Introduction or the Results section.

Link the conclusions with the goals of the study but avoid unqualified statements and conclusions not adequately supported by the data. In particular, distinguish between clinical and statistical significance, and avoid making statements on economic benefits and costs unless the manuscript includes the appropriate economic data and analyses. Avoid claiming priority or alluding to work that has not been completed. State new hypotheses when warranted, but label them clearly.

g. References

It is preferred that references and intext citations be in the National Library of Medicine (Vancouver) format, however, authors may choose to use the American Psychological Association (Harvard) format. The format selected by the authors should be used consistently throughout the manuscript.

References in the NLM/Vancouver style cited in the text shall be written as Arabic numerals in superscript at the end of the sentence in the order in which they appear in the text. Use the format in the Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals (updated 2025) which is available at www.icmje.org.Titles of journals should be abbreviated in the reference list according to the style used in Index Medicus. Electronic references should include the date that the material was accessed. Unpublished observations and personal communications may not be used as references. Examples of the correct manner of listing references in the NLM/Vancouver format are illustrated below:

Standard journal article
(List all authors when six or less; when seven or more, list only the first three then add "et al".)

Francis D, Hadler SC, Thompson S, et al. The prevention of hepatitis B with vaccine: Report of the Centers for Disease Control multi-center efficacy trial among homosexual men. Ann Intern Med 1982; 97:362-6.

Krugman S, Overby LR, Mushahwar IK, et al. Viral hepatitis type B: studies on the natural history and prevention reexamined. N Engl J Med 1979; 300: 101-6.

Nyland LJ, Grimmer KA. Is undergraduate physiotherapy study a risk factor for low back pain? A prevalence study of LBP in physiotherapy students. Retrieved from: http://www.Biomed-central.com/1471-2474/4/22. 2003. [Accessed August 27, 2011].

Rankin J, Tennant PW, Stothard KJ, et al. Maternal body mass index and congenital anomaly risk: A cohort study. Int J Obes 2010; 34(9): 1371-80. Available from: http://ncbi.nlm.nih.gov/pubmed/20368710.[Accessed August 27, 2011].

Books and other monographs

Personal authors

Adams RD, Victor M. Principles of Neurology. New York: McGraw-Hill; 1981.

Chapter in a book

Corbett S. Systemic Response to Injury and Metabolic Support. In:Brunicardi FC (editor). Schwartz's Principles of Surgery. 10th ed. New York: McGraw-Hill; 2015: 13-50.

It is preferred that at least up to 15 references be cited.

General Considerations

Authors should provide direct references to original research sources whenever possible. Authors should avoid citing articles from predatory or pseudo-journals. When preprints are cited, the citation should clearly indicate that the reference is a pre-print.

References to papers accepted but not yet published should be designated as "in press" or "forthcoming." Information from manuscripts submitted but not accepted should be cited in the text as "unpublished observations" with written permission from the source.

Avoid citing a "personal communication" unless it provides essential information not available from a public source, in which case the name of the person and date of communication should be cited in parentheses in the text. For scientific articles, obtain written permission and confirmation of accuracy from the source of a personal communication.

Referencing AI-generated material as the primary source is not acceptable.

To minimize bibliographic citation errors, references should be verified using either a bibliographic source, such as PubMed, or original sources. Authors are responsible for checking that none of the references cite retracted articles except in the context of referring to the retraction. For articles published in journals indexed in MEDLINE, the ICMJE considers PubMed the authoritative source for information about retractions. Authors can identify retracted articles in MEDLINE by searching PubMed for "Retracted publication [pt]", where the term "pt" in square brackets stands for publication type, or by going directly to the PubMed's list of retracted publications (https://www.ncbi.nlm.nih.gov/pubmed/?term=retracted+publication +[pt]). References should be numbered consecutively in the order in which they are first mentioned in the text. Identify references in text, tables, and legends by Arabic numerals in parentheses.

References cited only in tables or figure legends should be numbered in accordance with the sequence established by the first identification in the text of the particular table or figure. The titles of journals should be abbreviated according to the style used for MEDLINE (www.ncbi.nlm.nih.gov/nlmcatalog/journals). Journals vary on whether they ask authors to cite electronic references within parentheses in the text or

in numbered references following the text. Authors should consult with the journal to which they plan to submit their work.

h. Tables and figures

These should be submitted as a **separate Word or Excel file** (**NOT AN IMAGE FILE**), numbered with Arabic numerals and accompanied by a title and an explanatory caption at the top. Each table must be referred to in the text and an indication of the preferred position in the text should be given. Other explanatory materials should be placed in footnotes below the tables. All non-standard abbreviations should be explained in the footnotes. Vertical and horizontal rules between entries should be omitted. Each figure (graphs, charts, etc.) should be identified clearly and numbered in Arabic numerals and accompanied by a title and an explanatory caption at the bottom.

If you use data from another published or unpublished source, obtain permission and acknowledge that source fully.

i. Photographs

Photographs and illustrations should be submitted as a separate image file in jpeg format with a resolution of at least 800 x 600 dpi. Each photograph or illustration should be identified as a figure and numbered in Arabic numerals and accompanied by a title and an explanatory caption at the bottom. Specific points of interest in the photograph or illustration should be marked with an arrow or encircled. When symbols, arrows, numbers, and letters are used to identify parts of illustrations, each one should be identified and explained in the legend. Photographs of persons must be retouched to make the subject unidentifiable when possible and be accompanied by written permission from the subject to use the photograph.

j. Illustrations (Figures)

If a figure has been published previously, acknowledge the original source and submit written permission from the copyright holder to reproduce it. Permission is required irrespective of authorship or publisher except for documents in the public domain.

k. Abbreviations and Symbols

Use only standard abbreviations; use of nonstandard abbreviations can be confusing to readers. Avoid abbreviations in the title of the manuscript. The spelled-out abbreviation followed by the abbreviation in parentheses should be used on first mention unless the abbreviation is a standard unit of measurement.

For inquiries and concerns please contact:
UERMMMCI Health Sciences Journal
Research Institute for Health Sciences
2/F Jose M. Cuyegkeng Building
UERM Memorial Medical Center, Inc.
64 Aurora Boulevard, Barangay Doña Imelda,
Quezon City 1113
Secretary: Mr. Jason P. Barasona
Telephone Nos.: (632) 87161843
(632) 8715086-69 local 358
Email: research@uerm.edu.ph
jmnailes@uerm.edu.ph

UERM
MEDICAL CENTER
Research Institute
for Health Sciences

Research Institute for Health Sciences
2/F Jose M. Cuyegkeng Building
University of the East Ramon Magsaysay Memorial Medical Center
Aurora Boulevard, Brgy. Doña Imelda, Quezon City 1113
Telefax (02) 8716-1843; Trunk Line (02) 8715-0861 loc. 358
Email: research@uerm.edu.ph