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Factors associated with nurses' knowledge of frailty in older adults: A cross-sectional study

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Abstract: To assess frailty knowledge levels among registered nurses in Macao and identify key predictors, a descriptive cross-sectional survey was conducted among 353 registered nurses in Macao. The validated Older People Frailty Knowledge (OPFK) scale measured frailty knowledge. Data were collected online via SurveyMonkey and analyzed using SPSS 26.0. The mean OPFK score was 71.1 ± 10.0 (range, 45–92), indicating moderate-to-high frailty knowledge. Multiple regression showed female gender ($\beta = 0.18$, $P < 0.01$), ≥5 years of clinical experience ($\beta = 0.22$, $P < 0.001$), positive experiences with older adults ($\beta = 0.25$, $P < 0.001$), and intention to live with older adults ($\beta = 0.15$, $P < 0.05$) were significant predictors, explaining 10.2% of variance (adjusted $R^2 = 0.102$). Macao nurses have moderate-to-high knowledge of frailty, but gaps in frailty assessment. Integrating targeted assessment training into gerontological nursing education, promoting continuing professional development, and leveraging experiential predictors can enhance geriatric care capacity.

Keywords: *Frailty, Gerontological nursing, Macao nurses, Older adults, Older People Frailty Knowledge (OPFK) scale.*

1. Introduction

Global aging is an irreversible demographic trend, with the proportion of adults aged ≥60 years projected to rise from 12% in 2015 to 22% by 2050, and adults aged ≥80 years expected to reach 426 million by 2050 [1]. Macao, a special administrative region of China, faces similar challenges: the proportion of adults aged ≥65 years reached 13.3% in 2022 [2].

Frailty is increasingly recognized as a multidimensional geriatric syndrome associated with a significantly higher risk of disability, hospitalization, and mortality, thereby representing a major public health burden [3]. It is defined as a dynamic and reversible process characterized by diminished physiological reserve and increased vulnerability to both internal and external stressors. This condition arises from a complex interplay of genetic predisposition, lifestyle factors, acute illnesses, comorbidities, and environmental exposures [4]. Early identification and targeted intervention can improve clinical outcomes among older adults, supporting their ability to maintain independence and quality of life [5].

Global studies consistently demonstrate that healthcare professionals, including nurses, exhibit substantial gaps in knowledge related to frailty, particularly regarding its assessment and classification [6]. As frontline healthcare providers, nurses are uniquely positioned to perform frailty screening, evaluate frailty status, and deliver targeted preventive interventions. Nurses' level of frailty knowledge directly influences the quality of geriatric nursing care. Gerontological nursing (GN) has been established and applied as a compulsory undergraduate nursing curriculum since 2008 in Macao [7]. Limited research exists on studying Macao nurses' frailty knowledge and associated predictors; the present study addresses this research gap, providing empirical evidence for the optimization of gerontological nursing strategies in Macao.

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Frailty prevalence ranges from 12% to 49% among community-dwelling older adults and reaches 47.4% in hospitalized older populations [8, 9]. Frailty is influenced by aging combined with environmental, genetic, and chronic disease factors, including excessive alcohol consumption, cognitive impairment, falls, functional decline, hearing impairment, mood disorders, nutritional deficits, physical inactivity, polypharmacy, smoking, visual impairment, social isolation, and loneliness [10]. Early frailty screening and active interventions have been shown to improve quality of life among older adults while reducing the care burden on families and healthcare systems [11]. Evidence-based strategies for frailty management include targeted clinical assessment, physical rehabilitation, and nutritional support, with multidisciplinary teamwork identified as a critical component of successful intervention [12].

However, healthcare professionals often lack clarity regarding frailty criteria, particularly the classification of non-frailty and pre-frailty states, which impedes timely detection and intervention [13]. Previous research has identified several predictors of healthcare professionals' knowledge in gerontological care, including gender, clinical experience, educational level, workplace setting, and attitudes toward older adults [14]. Specifically, female nurses tend to demonstrate superior gerontological knowledge; those with more extensive clinical experience have greater exposure to older adult populations; and positive clinical experiences and favorable attitudes toward older adults foster proactive learning about geriatric care [15, 16]. Importantly, these findings are generalizable to gerontological care overall and not specifically focused on frailty-related knowledge, including its assessment, risk factors, and preventive strategies. Furthermore, the current state of knowledge gaps about frailty among nurses remains unclear. Therefore, the present study aims to: (1) evaluate frailty knowledge among nurses in Macao using the validated Older People Frailty Knowledge (OPFK) scale; and (2) identify predictors of frailty knowledge among Macao nurses in this study.

2. Research Methods

This descriptive cross-sectional study followed STROBE guidelines for an international, collaborative initiative of epidemiologists, methodologists, statisticians, researchers, and journal editors involved in the conduct and dissemination of observational studies [17].

2.1. Study Design, Setting, and Sample

Convenient sampling recruited registered nurses in Macao hospitals, community health centers, and nursing education institutions. Inclusion criteria: valid Macao registered nurse license, current nursing practice/education, internet access, and voluntary participation. Exclusion criteria: participation in the pilot study, language/technical barriers to survey completion. Sample size was calculated for cross-sectional surveys: 95% confidence level, ±5% margin of error, 50% expected prevalence of adequate frailty knowledge, minimum n = 341 [18, 19]. A total of 353 valid responses were included (expanded by 3% to ensure statistical power).

2.2. Measures

A self-administered online questionnaire included two parts: demographic information with professional characteristics and the Older People Frailty Knowledge (OPFK) scale.

2.2.1. Demographic and Professional Characteristics

Eight items covering age, gender, marital status, educational level, clinical experience, workplace, experiences with older adults (positive/negative), and intention to live with older adults (yes/no).

2.2.2. Older People Frailty Knowledge (OPFK) Scale

Developed from literature and validated in this study, the 20-item scale has three dimensions: frailty assessment (10 items), frailty factors (5 items), and frailty prevention (5 items). Each item uses a 6-point Likert scale (0 = strongly disagree to 5 = strongly agree), with a total score of 0–100 (higher = better knowledge).

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Content validity was evaluated by five gerontology experts (two geriatricians, two geriatric nursing supervisors, one nursing professor with ≥10 years of experience); content validity index (CVI) = 0.97 [20]. A pilot study with 30 Macao nurses confirmed Cronbach's α = 0.87, indicating good internal consistency [21].

2.3. Ethical considerations

The study received ethical approval to embark on this study in Macao (Review no. ESCSD/MSN-029/2021). As this study used an online questionnaire, the first page was designed as the information page to all participants. All participants were introduced to the information about the study purpose and process, and they could withdraw at any time without any negative consequences. No harm or potential risks associated with this study were addressed and explained to participants. All participants signed online informed consent forms, which were stored securely in a database. The participants' identities and personal data were replaced with research codes and presented as numbers in the written report. All online questionnaire data were saved on a password-protected hard drive.

2.4. Data Collection Procedures

Data were collected online via SurveyMonkey in 2021 [22]. QR codes were distributed through nursing associations, hospitals, and colleges. Participants read an informed consent form (study purpose, procedures, risks/benefits; voluntary withdrawal without consequences) and completed the survey (average 20 minutes). Of 372 distributed questionnaires, 353 were valid (response rate: 94.9%). Data confidentiality was maintained: no personal identifiers, password-protected storage, and personal information was replaced by research codes.

2.5. Data Analysis

Raw data were exported to Excel, coded, and double-checked. SPSS 26.0 was used for analysis: descriptive statistics (mean ± SD, frequency, percentage) summarized participant characteristics and OPFK scores; independent samples t-tests and one-way ANOVA compared scores across groups; multiple regression identified predictors ($P < 0.05$).

3. Results

3.1. Characteristics of Participants

A total of 353 nurses participated (mean age: 32.85 ± 7.17 years, range 22–58) (Table 1). Most were female (97.7%, n = 345), unmarried (50.4%, n = 178), and held a bachelor's degree (94.3%, n = 333). Mean clinical experience was 9.3 ± 6.8 years (range 1–32), with 63.5% (n = 224) having ≥5 years. Most worked in hospitals (73.0%, n = 257), followed by community health centers (27.0%, n = 96). A total of 81.3% (n = 287) had positive experiences with older adults, and 35.4% (n = 125) intended to live with older adults. Female overrepresentation aligns with global nursing demographics but limits gender generalizability [23].

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Table 1.
Demographic characteristics of participants (N=353).

Variable	Mean	S.D.	n	(%)
Age	32.85	7.17		
23 to 33 years old			187	52.97
34 to 58 years old			166	47.03
Gender				
Male			8	2.3
Female			345	97.7
Religion				
Yes			295	83.6
No			58	16.4
Marital status				
Unmarried			178	50.4
Married			175	49.6
Education				
College degree			9	2.5
Bachelor's degree			333	94.3
Master's degree			11	3.1
Positions				
Nurse			346	98
Specialist nurse			3	1
Nursing supervisor or above			4	1
Seniority	9.31	6.81		
5 years or less			129	36.5
5 years or above			224	63.5
Workplace				
Hospital			257	73
Community			96	27
Study Geriatric Nursing within the Bachelor of Nursing				
Yes			148	41.9
No			205	58.1
Enrolling in a Geriatric Specialist Nursing Program				
Yes			11	3.1
No			342	96.9
Being cared by older people aged 65 or above at childhood				
Yes			121	34.3
No			232	65.7
Lived with older people aged 65 or above				
Yes			105	29.7
No			248	70.3
Living with older people aged 65 or above				
Yes			12	3.4
No			341	96.6
Participated in older people's service and volunteer activities				
Yes			107	30.3
No			246	69.7
Have a good experience with older people aged 65 or above				
Yes			287	81.3
No			66	18.7
Willing to live with older people in the future				
Yes			125	35.4
No			228	64.6

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3.2. Nurses' Frailty Knowledge Levels

Mean total OPFK score: 71.1 ± 10.0 (range 45–92) (Table 2). Dimension scores: frailty assessment (33.5 ± 5.6, 67.0% of maximum), frailty factors (17.8 ± 3.7, 71.2%), frailty prevention (19.8 ± 2.9, 79.2%). Highest item: "Nutritional management could prevent frailty" (4.1 ± 0.7); lowest item: "The fulfillment of no following criteria was non-frail" (3.0 ± 1.0), indicating insufficient non-frailty classification knowledge [24].

Table 2.
Knowledge of frailty among nurses (N=353).

Variable	Mean (SD)
Total scores of OPFK	**71.1 (10.0)**
I. First dimension: Frailty Assessment	33.5(5.6)
1. Not every older person suffers from frailty	3.5(1.0)
2. Frailty is age-related	3.4(1.1)
3. Frailty associated with >5kg weight loss in the past year	3.2(0.9)
4. Frailty is associated with feeling tired or incapable of doing anything for more than three days in the past week	3.4(0.8)
5. Frailty is associated with decreased muscle strength in older adults, such as grip strength tests: men < 26 kg or women < 18 kg	3.4(0.9)
6. Frailty is associated with slow walking speed (walking speed < 0.8 m/s) in older people	3.3(0.9)
7. Frailty is associated with lower physical activity in older people - <383 calories/week (approximately 2.5 hours of walking) for men or <270 calories/week (approximately 2 hours of walking) for women	3.4(0.8)
8. The fulfillment of no following criteria was non-frail: A. Unintentional weight loss (>5kg weight loss in the past year) B. Self-reported exhaustion (feeling tired or incapable of doing anything for more than three days in the past week) C. Weakness (grip strength tests: men < 26 kg or women < 18 kg) D. Slow walking speed (walking speed < 0.8 m/s) E. Low physical activity (<383 calories/week (approximately 2.5 hours of walking) for men or <270 calories/week (approximately 2 hours of walking) for women)	3.0(1.0)
9. The fulfillment of one or two of the following criteria was considered pre-frail: A. Unintentional weight loss (>5kg weight loss in the past year) B. Self-reported exhaustion (feeling tired or incapable of doing anything for more than three days in the past week) C. Weakness (grip strength tests: men < 26 kg or women < 18 kg) D. Slow walking speed (walking speed < 0.8 m/s) E. Low physical activity (<383 calories/week (approximately 2.5 hours of walking) for men or <270 calories/week (approximately 2 hours of walking) for women)	3.3(0.8)
10. The fulfillment of three or more of the following criteria was classified as frail: A. Unintentional weight loss (>5kg weight loss in the past year) B. Self-reported exhaustion (feeling tired or incapable of doing anything for more than three days in the past week) C. Weakness (grip strength tests: men < 26 kg or women < 18 kg) D. Slow walking speed (walking speed < 0.8 m/s) E. Low physical activity (<383 calories/week (approximately 2.5 hours of walking) for men or <270 calories/week (approximately 2 hours of walking) for women)	3.4(0.8)
II. Second dimension: frailty factors	17.8(3.7)
1. Frailty could be caused by depression.	3.6(0.9)
2. Frailty correlates with sleep disturbance (positive correlation)	3.4(1.0)
3. Frailty is proportional to having multiple chronic diseases (positive correlation)	3.7(0.8)
4. Frailty is proportional to cognitive decline (positively correlated)	3.4(1.0)
5. Frailty is proportional to deficits in self-care (positively correlated)	3.7(0.9)

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Variable	Mean (SD)
III. Third dimension： frailty prevention	19.8(2.9)
1. Prevention of frailty can be tracked continuously through case management and multidisciplinary collaboration.	3.9(0.7)
2. Continued chronic disease management could prevent frailty.	4.0(0.7)
3. One hour of moderate-intensity aerobic exercise two days a week, such as walking, social dancing, or tai chi, are effective in preventing frailty	4.0(0.7)
4. Nutritional management could prevent frailty	4.1(0.7)
5. Social and psychological support could prevent frailty	4.0(0.8)

3.3. Predictors of Nurses' Frailty Knowledge

Univariate analysis identified six variables associated with OPFK scores ($P < 0.05$): gender, marital status, clinical experience, workplace, positive experiences with older adults, and intention to live with older adults. These were included in multiple regression.

Four variables were significant predictors (Table 3): female gender ($\beta = 0.18$, $P = 0.003$), ≥5 years of clinical experience ($\beta = 0.22$, $P < 0.001$), positive experiences with older adults ($\beta = 0.25$, $P < 0.001$), and the intention to live with older adults ($\beta = 0.15$, $P = 0.015$). Adjusted $R^2 = 0.102$, consistent with similar geriatric knowledge studies [25].

Table 3.
Relationship between knowledge and factors of frailty among nurses (n=353).

Variable	n (%)	OPFK		t[a]/F(df)[b]	P
		Mean (SD)			
Total scores	353(100)	71.1(10)			
Gender				2.48[a]	0.01*
Male	8(2.3)	62.5(10.8)			
Female	345(97.7)	71.3(9.9)			
Marital status				-2.73[a]	0.007**
Unmarried	178(50.4)	69.7(9.1)			
Married	175 (49.6)	72.5(10.6)			
Seniority				-3.58[a]	0.00**
5 years or less	129(36.5)	68.6(9.5)			
5 years or above	224(63.5)	72.5(10)			
Workplace				-2.69 [a]	0.007**
Hospital	257(72.8)	70.2(10.2)			
Community	96(27.2)	73.4(9.1)			
Have a good experience with older people aged 65 or above				-3.03[a]	0.003**
Yes	287(81.3)	71.8	10		
No	66(18.7)	67.7	9.17		
Willing to live with older people in the future				-3.43[a]	0.001**
Yes	125(35.4)	73.5	9.8		
No	228(64.6)	69.8	9.8		

Note: [a] Independent t-test.
[b] One way ANOVA
*Significance when p <0 .05
**Significance when p < 0.01.

4. Discussion

The frailty among older people can be improved through early detection and treatment. Nurses' knowledge in screening for frailty is particularly important to detect frailty in older adults globally. There was no clear information regarding healthcare professionals' knowledge of frailty screening [6]. The survey tool assessing knowledge of frailty among health workers is essential. This study used a

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tailor-made questionnaire from literature reviews to survey Macao nurses' knowledge of frailty in older people.

Macao nurses had moderate-to-high frailty knowledge, with strengths in prevention and gaps in assessment, consistent with global studies [6]. The relatively high knowledge level may result from compulsory gerontological nursing courses in Macao's bachelor's programs since 2008 [7].

Macau nurses had higher scores in knowledge of frailty among older people, including frailty assessment, factors, and prevention in this study. There is a lack of existing studies revealing knowledge of frailty among nurses or health workers; one recent study concluded that health workers expressed training needs in frailty screening and management [22]. This study revealed that Macao nurses had better knowledge of frailty, possibly because the Geriatric Nursing (GN) subject has been adopted as a compulsory, stand-alone subject in the Bachelor of Nursing program since 2008 in Macao [7]. Although GN courses were developed in the twentieth century, focusing on management and treatment of acute or infectious diseases [21], frailty is not the main topic of GN. Nurses who have taken the GN course may not have received a frailty learning program; therefore, frailty topics should be added to GN education to improve knowledge among nursing students and nurses.

Macao nurses have received GN knowledge through education and working experiences with older people [21] that promote nurses' knowledge in older people care, especially in the prevention of disease and the better knowledge in the prevention of frailty. Higher knowledge on "nutritional management could prevent frailty" among nurses may be related to the multidisciplinary cooperation with doctors, dentists, and nutritionists for a nutritional plan. Hospital-based multidisciplinary teams support frailty improvement through psychiatry, nutrition, rehabilitation, and pharmacy [23, 24]. Nurses play a vital role in these teams by collaborating and communicating with other health professionals to manage and prevent frailty in older adults.

Macao nurses need to improve their assessment ability in distinguishing between frailty and non-frailty, similar to previous studies [21-23]. The assessment should include biological, psychological, social, and cultural theories relevant to nurses [21]. The frailty training workshop and continuing education is suggested to contribute to nurses having more knowledge in frailty assessment [22] such as unintentional weight loss, exhaustion, weakness, walking speed, and physical activity among older adults.

Macao nurses lacked knowledge in "frailty correlates with sleep disturbance (positive correlation)" and "frailty is proportional to cognitive decline (positively correlated)." Exhaustion is the most common symptom of frailty [23, 24]. Sleep disturbance can cause older people to feel exhausted; nurses need to improve their assessment ability to identify sleep problems earlier. Higher knowledge among Macao nurses regarding "frailty is proportional to having multiple chronic diseases (positive correlation)," which may relate to caring for older people with multiple chronic diseases in hospitals and nursing homes [25, 26]. Nurses can connect the relationship between chronic disease and frailty among older people.

Predictors align with existing literature: female nurses had better knowledge (gender differences in care attitudes and career choices) [27]; nurses with ≥5 years of experience gained more older adult exposure [25]; positive experiences and the intention to live with older adults fostered favorable attitudes and proactive learning [28]. Only 2.3% of participants were male, limiting gender generalizability; future studies should recruit more male nurses [29].

The predictors in this study included being female, having over 5 years of working experience, having good experience with older people, and planning to live with older people in the future, which indicated a 10.2% better knowledge of frailty among older people among Macao nurses. This study concluded that female nurses had higher frailty knowledge towards older people. Compared to previous studies related to GN knowledge, female professionals scored higher in GN knowledge [14, 19]. Moreover, married nurses scored higher on frailty among older people. The possible reason is that married nurses have positive attitudes and more experience in caring for older people than single nurses

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[25]. Nurses with positive attitudes towards older people are willing to learn more about aging care [16].

Nurses who have over 5 years of working experience have higher knowledge of frailty. This result was similar to the previous study, which concluded nurses who have 6 to 10 years of nursing experience were 2.4 times more knowledgeable than those who have 1-5 years of experience in the nursing profession [25]. Moreover, those nurses who have over 10 years of nursing experience are 3.2 times more knowledgeable than those who have 1-5 year of experience in the nursing profession [25]. Experienced nurses have more opportunities to learn more GN knowledge and practice for ageing care. As global ageing, Macao also faces the same situation [7]. Macao nurses provide care for older people in hospital and community settings. They have knowledge and clinical practice in GN care. Community nurses had higher knowledge than hospital nurses; this may be related to the fact that hospital or acute care nurses have been trained to respond in patient care and urgent situations rather than in geriatric nursing care [23].

Macao nurses who had a good experience with older people and are willing to live with older people have higher knowledge of frailty among older people. Nurses living with older adults gained more care experience, which may enhance their understanding of elderly care [21, 27]. The finding can echo to Macao's previous study for more positive attitudes toward older people [7]. Predictors align with existing literature: female nurses had better knowledge (gender differences in care attitudes/career choices) [27]; nurses with five or more years of experience had increased exposure to older adults [25]; positive experiences and the intention to live with older adults fostered favorable attitudes and proactive learning [28]. Only 2.3% of participants were male, limiting gender generalizability; future studies should recruit more male nurses [29].

4.1. Implications for Enhancing Gerontological Nursing Practice in Frailty Care

Frailty management has become a vital part of gerontological nursing due to the increasing aging population and related healthcare challenges. Based on the analysis, key implications are proposed to enhance nursing capacity in frailty assessment, intervention, and holistic nursing care.

4.1.1. Curriculum Optimization in Gerontological Nursing Education

Gerontological nursing curricula should be systematically revised to integrate targeted frailty-related content, including theoretical foundations and practical skills. Specifically, curricula should incorporate comprehensive modules on frailty classification systems and evidence-based screening tools, such as Fried's frailty phenotype, which is a widely validated framework for identifying frailty in older adults. Additionally, digital health literacy training must be embedded into the curriculum to equip future nurses with the skills to utilize digital tools (e.g., mobile-based screening apps, telehealth platforms) in frailty assessment and monitoring, aligning with the evolving digital transformation of healthcare services. This curriculum reform is essential to address the knowledge gap in frailty care among novice nurses and ensure they are adequately prepared for clinical practice [30].

4.1.2. Promotion of Continuing Professional Development (CPD) through Blended Learning

The continuing professional development (CPD) programs tailored to frailty assessment and management for nursing professionals are imperative to update clinical skills and knowledge. Blended learning approaches, combining online self-paced modules with in-person workshops, have been validated as effective in geriatric nursing training, offering flexibility for busy clinicians while facilitating hands-on skill acquisition and peer interaction. These CPD programs should cover advanced topics such as individualized frailty intervention plans, interdisciplinary collaboration, and addressing the psychosocial needs of frail older adults, thereby enhancing the quality of care delivered in diverse clinical settings [31].

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4.1.3. Establishment of Cross-Setting Knowledge Exchange Programs

Knowledge sharing between community and hospital nurses is critical to bridging the gap in frailty care across different healthcare settings. Community nurses often have long-term relationships with older adults and possess expertise in preventive frailty care and community-based support, while hospital nurses gain extensive experience in managing acute frailty-related complications and post-acute care transitions. Establishing formal cross-setting exchange programs, such as clinical rotations, joint case conferences, and peer mentoring initiatives, can facilitate the transfer of specialized knowledge and best practices. This collaboration not only enriches the professional competence of individual nurses but also promotes continuity of care for frail older adults as they move between community and hospital settings [32].

4.1.4. Expansion of Gerontological Advanced Practice Nurse (APN) Programs

Advanced Practice Nurses (APNs) play a pivotal role in complex geriatric care, including frailty management, due to their advanced clinical judgment, leadership skills, and ability to provide holistic, patient-centered care. However, current data indicate a significant shortage of gerontological APNs, with only 3.1% of nursing professionals having completed APN training focused on geriatric nursing. Expanding gerontological APN programs through increased educational funding, partnerships between academic institutions and clinical facilities, and targeted recruitment efforts can benefit the frailty care of older people. These programs should emphasize advanced assessment techniques, pharmacotherapeutics for frail older adults, policy advocacy, and interdisciplinary team leadership, preparing APNs to take on expanded roles in frailty prevention.

4.1.5. Encouragement of Intergenerational Interactions to Foster Positive Attitudes Toward Frail Older Adults

Nurses' attitudes toward frail older adults significantly influence the quality of care they provide. Negative stereotypes or misconceptions about frailty can lead to suboptimal care, while positive attitudes promote empathy, respect, and person-centered care. Encouraging intergenerational interactions, such as organizing community visits where nurses engage with frail older adults in non-clinical settings, participating in intergenerational volunteer programs, or facilitating dialogue between nursing students and older adults, can help challenge stereotypes and foster favorable attitudes. These interactions allow nurses to gain a deeper understanding of the lived experiences, strengths, and needs of frail older adults, humanizing the care process and enhancing the therapeutic nurse-patient relationship [33, 34].

4.2. Limitations

This study has several limitations that should be acknowledged. First, the cross-sectional design used in this study highlights the need for follow-up longitudinal investigations to elucidate the temporal dynamics of this construct [35, 36]. Second, the Older People's Frailty Knowledge (OPFK) scale was tailor-designed for this study; future research can prioritize cross-cultural validation to establish its psychometric robustness across diverse healthcare contexts [37]. Third, this study included a quantitative research design to explore the level of knowledge of frailty and its predictors among nurses without qualitative approaches for experiences and the value for nursing practice in frailty [38, 39]

4.3. Future Research

Future research in frailty of gerontological nursing can consider assessing the impact of targeted frailty training on nurses' knowledge and clinical practice [31]; conducting longitudinal studies to monitor long-term knowledge retention [35]; validating the Older People-Focused Knowledge (OPFK) scale across diverse cultural regions [37]; and adopting mixed-methods approaches to identify barriers to effective frailty care [38, 40].

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5. Conclusions

This study provides novel insights into nurses' frailty knowledge in Macao, revealing overall moderate-to-high levels characterized by a strong understanding of frailty prevention, yet with identifiable gaps in assessment practices. Significant predictors of frailty knowledge included being female, having five or more years of clinical experience, positive interactions with older adults, and the intention to live with older adults.

The targeted strategies are recommended to enhance gerontological care and meet the health needs of older adults in the aging society, optimizing gerontological education, promoting continuing professional development (CPD), leveraging the experiential factors identified as significant predictors, and strengthening multidisciplinary collaboration. Beyond its contributions to filling a regional research gap, this study also provides actionable guidance for developing targeted gerontological nursing strategies in Macao.

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Institutional Review Board Statement:

The study was conducted in accordance with the Declaration of Helsinki and approved by the Human Research Ethics Committee at Macao Polytechnic University (Approval No.: ESCSD/MSN-029/2021).

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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