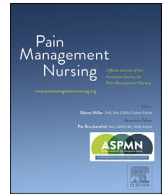




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Research Article

Pain Prevalence, Pain Management, and the Need for Pain Education in Healthcare Undergraduates

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ABSTRACT

Background: Pain is a common health problem in undergraduate students. Pain prevalence, pain management strategies and knowledge among healthcare groups has not been revealed yet.**Aim:** This study explored pain prevalence, intensity, pain management strategies, knowledge, and education in undergraduate students specializing in healthcare science. The findings will highlight the necessity for increasing pain management education in the university setting.**Design:** A questionnaire-based, cross-sectional study was conducted.**Settings/ Participants:** Data was collected from 1,490 university students in Tokyo between December 2015 and April 2016. A χ^2 square test was performed to examine differences in pain status and management strategies according to gender. We compared medical knowledge scores among disciplines using one-way analysis of variance.**Results:** In total, 511 (79.2%) students had experienced bodily pain during the preceding 6 months. Pain prevalence differed by gender. More nursing students had used both pharmacological and non-pharmacological methods for pain management than had students from other disciplines ($p = .011$). Pain medication knowledge of students in other disciplines was low to moderate, with greater knowledge observed in medical students ($p < .05$).**Conclusions:** Education regarding pain management should be developed that considers differences among disciplines. Additionally, poor pain management knowledge could affect the quality of care students provide to patients after graduation. Enhancing pain management knowledge by providing suitable pain management education in universities may contribute to better pain management for students, and this may translate to their work in clinical settings.

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Pain is a common health problem in undergraduate students. Many undergraduate students have lived with unrelieved pain that leads to reduced quality of life and poor school functioning, including factors such as absence from school, sleep disturbance, and reduced psychosocial well-being (Orhan et al., 2018; Robertson et al. 2017; Yesuf et al., 2018). Addressing pain would be beneficial to help this population maintain a productive university life. However, adolescents, including university students, do not typically possess appropriate knowledge or positive attitudes regarding

pain management (Chow & Chan, 2015; Shehnaz et al., 2014). Insufficient knowledge regarding pain control leads to poor pain management and increases the side effects experienced when using pain-relieving medication (Shehnaz et al., 2014).

From the perspective of undergraduate students in multiple healthcare disciplines, appropriate knowledge and skills regarding pain management leads not only to effective self-management of pain, but also effective care for future patients who are experiencing pain. Although healthcare students should be provided with education in regard to pain management as a priority, the International Association for the Study of Pain (2018) reported that pain education among healthcare students in many countries was alarmingly inadequate.

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In Japan, although the palliative care education for medical students includes pain control, little time is dedicated to this aspect of care (Nakamura et al., 2017). Additionally, newly graduated Japanese nurses experience difficulties in providing pain control for surgical patients or end-of-life patients, and need more knowledge regarding this aspect of care (Itoijima et al., 2014; Shimomura et al., 2017). The literature suggests that undergraduate healthcare curricula for pain management are inadequate in Japan.

To improve education on pain management, the content of education regarding pain management should include differences concerning pain severity and pain prevalence across genders as well as knowledge of pain management across different disciplines. Gender differences should be considered when educational content regarding pain management is developed. In population-based research, Bartley and Fillingim (2013) showed that pain prevalence and severity differ according to gender, with greater pain prevalence, severity, and frequency observed in women relative to men. Despite the need to provide pain management education for undergraduate students that considers gender differences, evidence exists on this topic.

Previous research has focused on pain management in specific diseases, such as dysmenorrhea, in university students, but global pain has not been addressed among university students (Kamel et al., 2017; Shabnam et al., 2016; Yesuf et al., 2018). Pain prevalence and frequency in male and female students should be examined to enhance understanding of the characteristics of gender differences in pain.

The differences among disciplines will affect students' preferences and knowledge regarding pain management, so it is important to consider the differences while planning and developing pain management education. Moreover, discipline-related differences in preferences and knowledge could affect not only students' current preferences and knowledge regarding self-pain management, but also future patient care provided by students. All healthcare students will be responsible for the provision of appropriate care to future patients experiencing pain. To provide effective pain education for healthcare students, it is necessary to understand differences in pain management knowledge and preferences among disciplines. However, a review of knowledge and attitudes toward pain management revealed that few studies involved healthcare groups other than medical and nursing students (Ung et al., 2016).

This study explored pain prevalence, intensity, pain management strategies, knowledge, and education in undergraduate healthcare students. The findings could contribute to the improvement of university education regarding pain management.

Method

Participants and Setting

We conducted a cross-sectional study using a self-administered questionnaire at a medical university in Tokyo; convenience sampling was used. The inclusion criteria for participants in this research were as follows: enrollment as a student in medicine (6-year program), dentistry (6-year program), nursing (4-year program), medical technology (4-year program), or dental hygiene and mechanics (4-year program). The exclusion criterion was being an overseas student because pain management curricula and practices differ among countries.

Cooperating closely with all course coordinators and teachers in each discipline, we ensured that the study procedure was followed carefully, including when the researchers would distribute the questionnaires to the participants. The researchers explained the study aim, and distributed questionnaires and cover letters containing information about the study to participants after class. We

installed a collection box that was available to participants for one day to ensure voluntary participation and anonymity; questionnaires were collected from the box the next day by the researcher. Final-year students in medical and dental disciplines were not present on the university campus during the data collection because they were engaged in practical training elsewhere; we informed them of the research aim and procedure by email. We placed the questionnaires and installed a collection box in a clerk's office for them after their clinical training. The study was conducted between December 2015 and April 2016.

Measurements

We measured pain prevalence and management using a pain management questionnaire previously developed in English by one of the authors (Tse et al., 2017). This original questionnaire was developed for an online survey. It consists of four sections: pain assessment, pain management, knowledge, and demographic data. This questionnaire had acceptable validity in terms of the item level of content validity index (I-CVI) and test-retest validity (Tse et al., 2017).

We translated the questionnaire from English into Japanese using the back-translation procedure proposed by Brisline (1986). We conducted a pilot study with 10 nursing students in another medical university to determine face validity. We modified descriptions in the questionnaire following the pilot study to adapt the items to Japanese culture as needed. For example, we changed "paracetamol" to "acetaminophen" in one sentence. This change was confirmed by the author who developed the English questionnaire.

Our questionnaire included four sections, as in the original version. In the first section, participants were required to assess pain prevalence and intensity of pain during the preceding 6 months using a 1–10 scale. In addition, they reported the extent of the effects of pain on their daily activities using a 6-point Likert scale ranging from 0 (no effect) to 5 (major effect). In the second section, participants were asked to indicate the pain management strategy they used when they experienced pain. In the third section, participants were asked to choose a response to indicate their knowledge regarding self-medication (eight items: overuse of nonsteroidal antiinflammatory drugs (NSAIDs) is very safe; long-term use of over-the-counter medications causes serious side effects; overuse of NSAIDs causes liver toxicity; NSAIDs could harm the kidneys if misused; NSAIDs cause stomach ulcers; I read the instruction sheet before using any medication; to decrease the risk of the serious side effects of pain medication, users should follow all dosage directions carefully; and I have altered medication dosages). Students' characteristics and need for education regarding pain management were recorded in the fourth section.

Data Analysis

Data were analyzed using descriptive statistics, including frequencies for categorical and numerical variables. A χ^2 square test was performed to examine the associations among discipline, pain prevalence, and management strategies. We compared medical knowledge scores among disciplines using one-way analysis of variance. A Dunnett test was performed for multiple post-hoc comparisons. IBM Statistical Package for Social Sciences Version 25 was used to perform the data analysis (SPSS INC., Chicago, IL, USA). Data were evaluated with a 95% confidence interval.

Ethical Approval

Ethical approval for the study was granted by the institutional review board at the university with which the authors were

affiliated. This study adhered to the Declaration of Helsinki guidelines (World Medical Association, 2013). Participants received a written description of the study, which outlined the aim and procedure, the voluntary and anonymous nature of participation, and data confidentiality.

Results

Demographic Characteristics

In total, 1,490 questionnaires were distributed, 661 (44.1%) were returned, and 652 were analyzed. Table 1 shows the participants' demographic characteristics, including gender, age, discipline, and pain status. More than half (68.5%) of the students were women, and all students were between the ages of 18 and 23 years. In total, 511 students (79.2%) had experienced bodily pain during the preceding 6 months.

Gender Differences in Pain Prevalence and Duration and Negative Effects on Daily Life

Table 2 shows the results of the comparison of pain prevalence, intensity, duration, and negative effects on daily life between genders. Pain status differed between men and women. For example, more women than men experienced headaches ($p = .035$) and shoulder pain ($p = .017$). In contrast, more men than women experienced chest ($p = .017$), elbow ($p = <.001$), wrist ($p = .001$), and knee pain ($p = <.001$). The mean pain intensity ranged from 2.8 (SD = 2.3) to 5.4 (SD = 1.9).

Regarding negative effects on daily life, more women than men were negatively affected in terms of academic performance ($p = .004$), general activity ($p = .006$), mood ($p = .001$), daily work ($p = .034$), and relationships with others ($p = .048$).

Pain Management Strategy Preferences and the Need for Pain Management Education

Table 3 shows preferences for pain management strategy and need for pain management education. Students from all disciplines used both pharmacological and nonpharmacological methods of pain management. However, more nursing students used both

methods than did students of other disciplines ($p = .011$). In addition, more female than male students used both pharmacological and nonpharmacological methods ($p = .002$).

Only 3.7% to 19.7 % of students had experience with education about pain management. In addition, many students from all disciplines believed they needed to learn pain management, with a higher number of nursing students expressing this need relative to those of other disciplines ($p < .001$).

Discipline Differences in Knowledge of Pharmacological Pain Management

Table 4 shows the mean scores for knowledge of pharmacological pain management and differences in mean scores among disciplines. Medical students' pain knowledge was higher than that observed in nursing and other students (e.g., medical technologists, dental hygienists, and dental mechanics). Nurses' mean pain management scores were moderate, and those of other disciplines were below the median of the scale.

Discussion

We examined pain prevalence and management in undergraduate students specializing in healthcare sciences in Japan. The results showed gender differences in pain prevalence and intensity, and discipline differences in pain management strategies and pharmacological knowledge.

Pain was reported by 79.2% of the sample, and the nature of pain differed according to gender. More female than male students experienced headaches and shoulder pain. The findings of the current study are consistent with previous research, in which the likelihood of headaches in female students was approximately three times higher than that of male students, potentially because of endocrine factors (Birru et al., 2016). Additionally, dysmenorrhea was rated highest in terms of pain intensity at 5.4 (SD = 2.3). Our research suggests that female students experience severe pain during university life, and the university should support pain relief for female students.

In contrast, more male than female students experienced knee and elbow pain. A cross-sectional data on 60 years old adults in West Scotland showed that joint pain was more often reported by women than by men (Admanson et al., 2006). Pain prevalence in the younger generation and in Asian area should be examined in future research.

Overall, the findings of this study suggest that undergraduate students should be educated regarding pain management, taking into account gender difference. For example, faculty members and people responsible for students' health, such as staff in student health centers, should provide information regarding not only the best way to relieve headaches but also possible causes of headache in female students. Understanding the causes of pain could allow students to address headaches in advance. Additionally, educating male healthcare students about headaches in female students could allow male students to better address the needs of female patients in future clinical settings.

Our results also revealed that more female than male students experienced negative effects of pain on academic performance, mood, and relationships with others. Student health center staff should consider how to provide female students with pain management and develop support systems for university students experiencing pain to prevent the negative effects of pain on daily life. The most common type of pain experienced by female students was that caused by dysmenorrhea. Female students should use self-medication or other self-management for nonsevere dysmenorrhea-related pain. However, if such pain is severe,

Table 1
Demographic Characteristics (N = 652)

Characteristic	n (%)
Pain	
Yes	511 (79.2)
No	134 (20.8)
Sex	
Female	442 (68.5)
Male	203 (31.5)
Age	
18–23 years	584 (90.5)
24–29 years	54 (8.4)
≥30 years	7 (1.1)
Discipline	
Medicine	203 (31.5)
Dentistry	126 (19.6)
Nursing	122 (70.0)
Other (e.g., medical technology)	193 (30.0)
Year of study	
1	170 (26.4)
2	115 (17.9)
3	162 (25.2)
4	121 (18.8)
5	74 (11.5)
6	2 (0.3)

Table 2

Pain Prevalence, Pain Intensity, Duration, and Negative Effects on Daily Life (N = 511)

	Sex				<i>p</i> [*]
	Female		Male		
	n (%)	Mean Pain Intensity (SD)	n (%)	Mean Pain Intensity (SD)	
Pain sites					
Head	223 (65.2)	4.6 (2.0)	73 (54.5)	4.1 (1.8)	.035
Neck	153 (44.6)	3.8 (2.0)	61 (45.5)	2.8 (1.9)	.918
Shoulder	215 (62.1)	4.2 (2.0)	66 (49.6)	4.0 (2.2)	.017
Chest	58 (16.8)	3.0 (1.8)	35 (25.9)	3.3 (1.7) [†]	.029
Stomach	128 (36.8)	4.1 (2.0)	41 (30.4)	3.8 (1.9)	.203
Abdomen	191 (55.5)	4.7 (2.1) [†]	74 (54.8)	2.7 (2.0)	.484
Dysmenorrhea	276 (79.5)	5.4 (2.3) [†]			
Elbow	12 (3.5)	3.7 (2.0)	19 (14.1)	3.2 (1.7) [†]	<.001
Wrist	51 (14.9)	3.4 (2.1)	38 (28.1)	3.1 (1.9)	.001
Upper limb	54 (15.7)	3.9 (1.8)	25 (18.7)	3.0 (1.3)	.493
Knee	71 (20.6)	3.7 (2.2) [†]	54 (40.0)	3.8 (1.9) [†]	<.001
Malleolus	14 (4.1)	4.4 (3.1)	11 (8.2)	4.8 (2.8)	.106
Lower limb	79 (23.0)	4.2 (2.3)	32 (23.5)	3.6 (1.8)	.905
Upper back	68 (19.8)	4.0 (2.1)	30 (22.3)	3.7 (1.6)	.153
Lower back	204 (59.5)	3.8 (2.1)	71 (52.2)	3.6 (2.3)	.615
Ankle	38 (11.1)	4.5 (2.3)	23 (17.2)	5.0 (2.3) [†]	.093
Pain duration					
<1 day	10 (2.8)		11 (7.5)		.052
1 day to 1 week	218 (61.6)		77 (52.4)		
1 week to 1 month	80 (22.6)		32 (21.8)		
1-3 months	29 (8.2)		15 (10.2)		
3-6 months	17 (4.8)		12 (8.2)		
Negative effects on daily life [‡]					
Academic performance	137 (38.8)		38 (25.5)		.004
General activity	147 (42.0)		43 (28.9)		.006
Mood	202 (57.2)		61 (41.2)		.001
Walking	68 (19.5)		37 (24.8)		.188
Daily work	118 (34.0)		36 (24.2)		.034
Relationships with others	66 (18.9)		17 (11.4)		.048
Sleep	102 (29.1)		36 (24.3)		.324
Enjoyment of life	81 (23.1)		29 (19.5)		.410
Overall effect of pain on life [‡]					
Yes (vs No)	142 (40.1)		35 (24.5)		.001

^{*} *p*-value is for the between-gender comparison of pain prevalence.[†] Item included missing data.[‡] Likert scale scores dichotomized as 3, 4, or 5 = yes and 0, 1, or 2 = no. For example, if a participant's answer regarding academic performance was 3, this was interpreted as a negative impact on academic performance.

faculty members should suggest that female students with dysmenorrhea visit the student health center. Interestingly, past research has revealed that female students feel that school nurses do not provide care for students' menstrual pain since it is considered normal (Aziato et al., 2015). Although this previous research was conducted in Ghana, similar situations may occur in many countries. School doctors and nurses should provide appropriate care for pain, and female students may benefit from additional education.

Pain management strategies also differed between disciplines. More nursing students used both nonpharmacological and pharmacological methods of pain management than did students from other disciplines. In addition, more female than male students used both nonpharmacological and pharmacological methods of pain management. The nursing students were more likely to be familiar with nonpharmacological methods because they learn massage and use of heat in fundamental nursing skills classes (Ruth et al., 2016). Briggs et al. (2013) indicated that students choose pain

Table 3

Pain Management Strategy and Need for Pain Management Education

	Pain Management Strategy (n = 550)					Experience of Pain Education (n = 642)			Need for Pain Management Education (n = 634)		
	Pharmacological Methods	Non-Pharmacological Methods	Both	Ignore	<i>p</i>	Yes	No	<i>p</i>	Yes	No	<i>p</i>
Discipline											
Medicine	41 (23.4)	21 (12.0)	63 (36.0)	50 (28.6)	.011	25 (12.3)	178 (87.7)	<.001	119 (59.2)	82 (40.8)	.48
Dentistry	21 (19.4)	13 (12.0)	49 (45.4)	25 (23.1)		23 (18.3)	103 (81.7)		84 (67.2)	41 (32.8)	
Nursing	18 (18.2)	9 (9.1)	51 (51.5)	21 (21.2)		24 (19.7)	98 (80.3)		87 (73.1)	32 (26.9)	
Other	53 (31.5)	12 (7.1)	50 (29.8)	53 (31.5)		7 (3.7)	184 (96.3)		114 (60.3)	75 (39.7)	
Sex (n = 551)											
Female	91 (24.4)	30 (8.0)	162 (43.4)	90 (24.1)	.002						
Male	42 (23.6)	25 (14.0)	51 (28.7)	60 (33.7)							

Table 4
Knowledge of Pharmacological Pain Management

Discipline	Pharmacological Knowledge* (n = 625)
	Mean (SD)
Medicine	5.05 (2.08) ^{†,‡,§}
Dentistry	4.86 (2.06) ^{†,‡,§}
Nursing	4.13 (1.91) ^{†,§, ,¶}
Other	3.42 (1.73) ^{†,‡, ,¶}

* Scores summed before calculating mean score. Scores ranged from 0 to 8 (correct answer: 1, incorrect answer or Do not know: 0).

[†] ANOVA with Dunnett C post-hoc test.

[‡] Significantly different from nursing.

[§] Significantly different from other disciplines.

^{||} Significantly different from dentistry.

[¶] Significantly different from medicine.

management strategies with which they are familiar. Nursing students could therefore adapt learned nonpharmacological pain management strategies to daily life.

Our results showed that pharmacological knowledge in students of nursing and other disciplines (e.g., medical technology, dental hygiene, dental technologists) was poor. Therefore, we infer that medical and dental students learned more pharmacology than did nursing and other students in regular curricula. Nursing and other students should endeavor to acquire basic pharmacological knowledge to provide high-quality care for patients.

This study found that approximately 60% of students require additional pain management education, which suggests that the current curriculum regarding pain management is insufficient for undergraduate students. Our results revealed that healthcare students should learn more pharmacological knowledge; students in nursing and other disciplines had low to moderate knowledge about pain medication, while medical students scored slightly higher than them. Moreover, we think that healthcare students need improved curricula about nonpharmacological methods, because nonpharmacological methods were included less than pharmacological methods in the pain curricula of healthcare universities (Miro et al., 2019).

While the curriculum of medical students in Japan includes basic pharmacological knowledge and Chinese medicine, other nonpharmacological methods, such as massage and acupuncture, are not presented as pain-relieving methods (Medical Education Model Core Curriculum Coordination Committee & Medical Education Model Core Curriculum Expert Research Committee, 2017). In nursing curricula, although basic pharmacological knowledge, massage, and heat application are included, Chinese medicine and other nonpharmacological methods are not included (Ministry of Education, Culture, Sports, Science and Technology of Japan, 2017). Current pain management education for healthcare students is incomplete; systematic learning should be encouraged to develop multidisciplinary knowledge and skills regarding pain management.

Interprofessional education in pain management has recently been promoted after the World Health Organization (2010) emphasized interprofessional education and collaborative practice (Gorden et al., 2018). Interprofessional collaboration can contribute to the management of complex pain, as medical, nursing, and dental students can share ideas or views about pain management for patients. For example, interprofessional education regarding elderly patients with pain can lead to creation of care plans that combine pharmacological and Chinese medicine or nonpharmacological treatment such as massage. In this form of education, undergraduate students study pain management from several perspectives, which could facilitate high-quality care for patients. Although interprofessional education regarding pain

management is effective, its implementation requires time and resources. In Japan, some universities have introduced e-learning to teach healthcare skills and knowledge to undergraduates (Takimoto et al., 2019; Shimizu et al., 2019). However, interprofessional pain management education is not currently a part of e-learning in Japan. Tse and colleagues (2017) suggested that web-based education regarding pain management should be provided for undergraduate students. Reeves and colleagues (2017) indicated that online interprofessional e-learning exerted a positive effect on learners' reactions and attitudes. Further, e-learning content in interdisciplinary education should include both pharmacological and nonpharmacological knowledge.

Limitations

This study was subject to several limitations. For example, the generalizability of the results is limited because we used convenience sampling at one university. Further, half of the participants were students enrolled in the first 3 years of study, but scores for pain-related medical knowledge could differ in the final year. Larger and more diverse samples should be included in future studies. In addition, our research did not examine why undergraduate students chose particular pain management methods. This should be explored in future qualitative research.

Conclusion

The results of this study indicated that many undergraduate students experienced pain and managed it themselves. However, there was a gender difference in pain prevalence. Moreover, students' pain management knowledge differed among disciplines. Given these results, pain management education should be developed that considers gender and disciplinary differences. Further, interprofessional education should be considered for pain management.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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