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Do health literacy levels of nursing students change throughout the study programme? A cross-sectional study

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ABSTRACT

Objectives The aim of this research was to analyse if the level of health literacy (HL) of nursing students changes throughout the study programme.

Design A cross-sectional study with anonymous self-reporting was conducted.

Participants/setting 329 public university nursing students in Seville, Spain; 243 of the first year and 86 of the fourth.

Interventions The short Spanish version of the Health Literacy Survey Questionnaire-European Union was used to evaluate HL.

Primary and secondary outcome measures The proportions of the limited level of HL were compared between academic years and the crude and corrected OR were calculated with the Mantel-Haenszel test to evaluate the effect of confusion of the sex variable on the HL level and academic year relationship. A logistic regression model with step-by-step analysis was run, including the independent variables sex, age, marital status, academic year and HL level (limited/sufficient) as the dependent variable.

Results 62.1% of the participants of the first year versus 47.7% of the fourth year had a limited literacy level for a crude OR of 1.5 (95% CI 1.10 to 2.21; p=0.014) and a corrected by sex OR of 1.8 (95% CI 1.10 to 2.96; p=0.026). Only the strata in women had a statistically significant relationship. The logistic regression model ratified that the HL was a function exclusive to the academic year.

Conclusion The HL level of nursing students increases from the first to the fourth academic year, even when controlling for sex. Although the HL level in the fourth academic year was greater than that of the first, both groups had inadequate HL levels. It is hence recommended to implement intervention strategies, which reinforce in the curriculum the knowledge and experiences related with health communication and education to ensure that future professionals improve their HL. Achieving adequate HL is crucial to be able to provide care to patients, their families and the community.

Strengths and limitations of this study

► Cross-sectional design and associations observed do not necessarily establish a cause–effect relationship.
► This is a single-centre study in 329 nursing students.
► As a strength, this research has applied the Health Literacy Survey Questionnaire-European Union questionnaire, a scale widely used in Europe.
► The main limitation is the imbalance between the number of participants in each academic year.
► The existence of gender bias in the population may be conditioning the lack of significant influence of gender on health literacy levels.

take decisions in everyday life concerning healthcare, disease prevention and health promotion to maintain or improve quality of life during the life course'. HL is intimately related to literacy in general and with the sociodemographic and economic characteristics of the population and, therefore, means a direct and significant impact on the individual and collective health of people.[2]

A low level of HL is among others associated with limited comprehension of health information, inefficient disease self-management, less use of preventive services, mistakes and poor compliance with treatments, increased hospital admissions and a rise in health expenditure. Therefore, a low HL is directly associated with a worse state of health.[3–5]

A multifactorial and multidisciplinary approach is necessary to improve the population's HL, this being considered a primordial health strategy.[6] To do so, the training and sensitisation of health professionals who interact with patients is indispensable,[7] with the aim of enhancing and improving the communication between them and inducing a change in health organisations and systems for HL to be included in their services.[6 7]

Nurses play a key role in providing people, families and groups in a variety of environments, with information concerning

INTRODUCTION

According to Sørensen *et al*[1] health literacy (HL) 'is linked to literacy and entails people's knowledge, motivation and competences to access, understand, appraise, and apply health information in order to make judgments and

healthcare.[8] The patient's education and effective communication are an integral part of the care,[9] and the nurse must be in an optimum position to evaluate the needs of health education for people to understand and act according to the information necessary to improve their health.[10] In spite of this need, nurses may lack the knowledge and skills indispensable to be effective educators,[11] so we must evaluate if the future professionals are prepared, from when they are trained in universities, in order to apply the appropriate interventions. Given that women are predominant in the nursing profession[12] and that they have been related with a greater HL than men,[13 14] this study is designed with the aim of analysing both if the level of HL of nursing students changes throughout the study programme and the effect of gender.

METHODS

A cross-sectional study was carried out. The study population was nursing students enrolled in 2019 in a public university in Seville (Spain). No sampling was done as the aim was to research all students in the first and fourth academic year groups, as this was an accessible size for data collection. Students of the first year (n=243) and the fourth year (n=86) were included in the research. The percentage of participation of the first year was 96.4% and that of the fourth year was 43%. The non-participation was due to some students not attending class the day in which the information was collected. No student present during the information collection refused to complete the form. The exclusion criterion was not answering more than one item of the questionnaire.

Data collection

A form was used which included the variables age, sex (man and woman), marital status (single, married, separated, widowed and other type), academic course (first and fourth) and the Health Literacy Survey Questionnaire-European Union (HLS-EU-Q). To collect data, the researchers used classes which had the highest numbers of attendees in the first and fourth years. The data collection day was not notified in advance. Participants filled in the form before class. After explaining the research's aims, methodology and expected results, the students were invited to participate voluntarily in the study and they gave their consent, filling out the form themselves.

Questionnaire development and content

The short version of the Spanish HLS-EU-Q was used,[15] showing 16 of the 47 items of the original questionnaire. Although answers were given on a Likert scale (1—very difficult, 2—difficult, 3—easy, and 4—very easy referring to the activities listed in the items), scores were dichotomised for the analysis: 'very difficult and difficult'=0 and 'easy and very easy'=1. The sum of the dichotomous answers of the 16 items was classified into two levels of HL: 'limited' (0–12 points) and 'sufficient' (13–16 points).[16]

Data analysis

The data collected was analysed using IBM SPSS Statistics for Windows, V.27.0 (IBM Corp). All variables were examined for outliers and non-normal distributions. When variables fulfilled criteria of normality, central trend and dispersion measurements were calculated. Proportions were calculated for the variables measured at the nominal or ordinal level.

The strength of association between the limited level of HL and the study variables was analysed with OR and their respective confidence intervals of 95% (95% CI), and the relation between the two variables was verified with the χ^2 test. Fisher test was used when an expected value was less than 5. Taking into account the possible effect of sex on the relation between academic year and the score of the short version of the Spanish HLS-EU-Q, stratification by sex was accomplished during the analysis, the OR was calculated with their respective 95% CI, and the OR was corrected with the Mantel-Haenszel test (OR_{M-H}).

Binary logistic regression models were performed with enter analysis, including the independent variables: age, sex, marital status and academic course. The score of the HLS-EU-Q16 was used as the dependent variable, assigning the value of 0 for those who had scores between 0 and 12 (limited literacy) and of 1 for 13–16 (sufficient literacy). Other conditions of the model were: the probability of entering the model between 0.05 and 0.10, the classification table had a cut-off point of 0.5 and a maximum of 20 interactions to examine, and the statistical significance of the parameters estimated was interpreted in accordance with a value of 0.05. The Hosmer-Lemeshow test was used to assess the goodness of fit for the model.

Patient and public involvement

Neither the participants nor the public participated in the study design.

RESULTS

Cronbach's alpha was 0.78 for the total number of the participants, 0.75 for those of the first year, and 0.82 for those of the fourth; these values are considered appropriate.[17] In case an item was not answered, it was replaced with the mean of each item, the criterion being that it was a question of an arbitrary pattern.[18] Twenty-nine questionnaires were not considered as students failed to provide answer in one item.

As shown in table 1, participants in both courses of this study were predominantly woman and single, but there was a significant difference by age, with 20.1 years in the first academic year and 22.1 years in the fourth year (p<0.001).

Analysing the HLS-EU-Q16 score, it is also noted that there are statistically significant differences for the mean of the total score between the first and fourth year (11.8 vs 12.6; p=0.018), and in the items of the questionnaire: I02 'Check where to get professional help when you are ill' (p=0.039), I03 'Understand what the doctor says'

Table 1 General characteristics of the participants and mean values of the total Health Literacy Survey Questionnaire-European Union (HLS-EU-Q16) and for each item according to the academic year

Variable	Academic year of nursing class		Statistic	P value
	First (n=243)	Fourth (n=86)		
Age; mean (SD)	20.1 (4.5)	22.1 (2.2)	−4.01*	<0.001
Sex; n (%)				
Male	56 (23.0)	16 (18.6)	7.33†	0.45
Female	187 (77.0)	70 (81.4)		
Marital status; n (%)			2.16‡	0.33
Single	237 (97.5)	86 (100.0)		
Married	2 (0.8)	0 (0.0)		
Separated	4 (1.6)	0 (0.0)		
Widowed	0 (0.0)	0 (0.0)		
Other type	0 (0.0)	0 (0.0)		
Items of the HLS-EU-Q16; mean score (SD)				
I01	2.9 (0.5)	3.0 (0.5)	−0.483*	0.629
I02	3.2 (0.6)	3.1 (0.6)	2.227*	0.039
I03	2.8 (0.5)	3.0 (0.6)	−2.478*	0.014
I04	3.0 (0.5)	3.2 (0.6)	−1.841*	0.066
I05	2.2 (0.6)	2.5 (0.8)	−4.183*	0.102
I06	2.7 (0.7)	2.8 (0.6)	−1.072*	0.285
I07	3.1 (0.5)	3.2 (0.5)	−0.643*	0.521
I08	2.4 (0.7)	2.4 (0.6)	−0.513*	0.609
I09	3.3 (0.7)	3.3 (0.6)	0.122*	0.903
I10	3.4 (0.6)	3.4 (0.6)	−1.013*	0.313
I11	2.5 (0.8)	2.7 (0.8)	−2.681*	0.008
I12	2.6 (0.7)	2.8 (0.7)	−1.554*	0.121
I13	3.0 (0.7)	3.0 (0.6)	0.126*	0.912
I14	3.1 (0.6)	3.2 (0.6)	−0.744*	0.458
I15	2.9 (0.6)	3.1 (0.6)	−3.427*	0.001
I16	3.1 (0.7)	3.2 (0.6)	−0.657*	0.512
Total	11.8 (2.4)	12.2 (2.3)	−2.359*	0.019
HL level; n (%)				
Limited	151 (62.1)	41 (47.7)	5.46†	0.018
Sufficient	92 (37.9)	45 (52.3)		

*Student's t-test.
†Pearson's χ^2.
‡Fisher's exact test.
HL, health literacy.

(p=0.014), I11 'Value the reliability of the information about risks for health that appear in the media' (p=0.008), and in I15 'Understand the information provided by the media about how to improve your health' (p=0.011). With the exception of item I02, for the previous associations the score was higher in the students of the fourth year than in those of the first year.

The items with the lowest score were I05 'Value when a second opinion of another doctor may be needed', I08 'Find information about how to deal with mental health problems, such as stress or depression', and I11 'Value the reliability of the information about risks for health that appear in the media', although the difference in I11 was the only one that was statistically significant.

When the association between the course and the literacy level is revised, it is observed that 62.1% of the participants of the first course versus 47.7% of the fourth course have a limited HL level, for a crude OR of 1.5 ((95% CI 1.10 to 2.21); p=0.018). When this is stratified by sex, it is found that the strength of the association

Table 2 OR and 95% CI of the OR by academic year (first/fourth) stratified by sex according to Health Literacy Survey Questionnaire-European Union (HLS-EU-Q16) items according to the difficulty to carry out the activities of HL

Items	Sex		
	Male (95% CI)	Female (95% CI)	Total (95% CI)
I01	1.52 (0.29 to 7.78)	1.1 (0.52 to 2.33)	1.17 (0.59 to 2.31)
I02	1.47 (0.15 to 13.5)	0.3 (0.12 to 0.75)**	0.41 (0.18 to 0.91)*
I03	1.52 (0.29 to 7.7)	1.81 (0.90 to 3.50)	1.72 (0.91 to 3.27)
I04	0.54 (0.08 to 3.25)	0.86 (0.37 to 1.97)	0.78 (0.37 to 1.13)
I05	1.13 (0.34 to 3.79)	2.58 (1.44 to 4.64)**	2.18 (1.29 to 3.68)**
I06	0.73 (0.21 to 2.47)	1.53 (0.84 to 2.77)	1.31 (0.76 to 2.24)
I07	3.52 (0.18 to 67.18)	0.83 (0.24 to 2.81)	1.25 (0.40 to 3.91)
I08	0.83 (0.27 to 2.55)	1.17 (0.67 to 2.04)	1.08 (0.65 to 1.77)
I09	3.26 (0.38 to 27.62)	0.90 (0.35 to 2.27)	1.21 (0.53 to 2.79)
I10	2.14 (0.24 to 18.83)	1.39 (0.37 to 5.51)	1.64 (0.53 to 4.958)
I11	0.72 (0.24 to 2.21)	2.57 (1.43 to 4.61)**	1.97 (1.18 to 3.29)**
I12	1.65 (0.51 to 5.38)	0.99 (0.57 to 1.75)	1.10 (0.66 to 1.83)
I13	0.61 (0.14 to 2.73)	1.12 (0.56 to 2.21)	0.99 (0.53 to 1.85)
I14	3.23 (0.38 to 27.62)	0.93 (0.34 to 2.50)	1.29 (0.53 to 3.11)
I15	1.47 (1.21 to 1.78)**	1.28 (0.59 to 2.77)	2.22 (1.07 to 4.59)*
I16	0.78 (0.68 to 0.90)*	1.51 (0.68 to 3.32)	1.99 (0.93 to 4.27)

Significance level: * p value<0.05, ** p value<0.01.

between literacy level and the course (OR_{M-H}=1.80 (1.10–2.969); p=0.026) was slightly reduced from 1.8 to 1.5. Also, the relationship of the HL and the course was only significant in the women strata.

An equal effect of confusion for the sex variable was noted in five of the 16 items. The OR indicated a greater risk of difficulty to carry out the activities of HL in students of the first course when they were compared with those of the fourth year in the items I05 'Value when a second opinion of another doctor may be needed' (for the total and in women; p=0.003 and p=0.001, respectively), I11 'Value the reliability of the information about risks for health that appear in the media' (for the total and in women; p=0.006 and p=0.001, respectively), and I15 'Understand the information provided by the media about how to improve your health' (for the total and in men; p=0.017 and p=0.001, respectively). On the other hand, a greater risk of difficulty to carry out the activities of HL was found in the students of the fourth year compared with those in the first in item I02 'Check where to get professional help when you are ill' (for the total and in women; p=0.025 and p=0.010, respectively), and in I16 'Value which of your daily habits affect your health' (for men; p=0.036, respectively). See table 2.

As it was noted in the model, HL was exclusively explained by academic year variable (table 3) and the students of the first year had a 22% risk excess for a limited HL compared with those of the fourth year (table 4).

The logistic regression showed an accuracy of 60.5% and a general moderated agreement for classifying the subject correctly into limited or sufficient HL, showing better results in the classification of subjects with a limited HL (77.8%) than in those with a sufficient HL (37.0%) (table 5). The result of the Hosmer-Lemeshow test was p=0.61 (χ^2=5.35, df=7), which indicated that the logistic regression model had a good fit.

DISCUSSION

This study, which examined the HL level of nursing students in the first and fourth academic years at the University of Seville, showed that the HLS-EU-Q16 score was higher in the fourth year than in the first (11.8 vs 12.6, p<0.05), a finding that was corroborated in the logistic regression, where HL was positively related to the academic year. This is consistent with other researchers conducted with nursing students in the USA,[19] Turkey[20 21] and Jordan,[22] in which it was noted that

Table 3 Initial binary logistic regression for limited health literacy as dependent variable and sociodemographic indicators as predictors

Variable	OR	95% CI		P value
		Lower	Upper	
Constant	0.20			<0.001
Age	1.01	0.93	1.10	0.771
Sex	0.93	0.54	1.60	0.797
Marital status	2.14	0.37	12.38	0.395
Academic year	1.22	1.02	1.46	0.031

Table 4 Final binary logistic regression for limited health literacy as dependent variable and academic year course as predictor

Variable	OR	95% CI Lower	95% CI Upper	P value
Constant	0.19			<0.001
Academic year	1.22	1.03	1.44	0.020

the HL level increased as students advanced in the study plan and they were exposed to clinical and community practices in which they learn to provide care and experience that individuals' health education is a subject of vital importance.[5]

What is certain is that the experience acquired by nursing students during their formative years is associated with an improvement in their health knowledge.[23] If universities focus on HL in their curricula, future nurses will undoubtedly have more opportunities to improve and apply their health knowledge.[24]

The proportion of students with a limited HL level in this study was 62.1% in the first academic year and 47.7% in the fourth. The result obtained for the first year in this study was very similar to the 58.3% of the Spanish general population (measured with the HLS-EU-Q47).[13] Regarding other researches with nursing students which have also used the HLS-EU-Q16, the percentage of limited HL obtained in both academic years of our study is higher than that reported in Turkish students (29%)[25] and in students of the fourth university academic year of a study in Spain and France (30.2%).[26]

Similar to findings of the studies[26] in Spanish and French universities, students of the first and fourth academic year had the lowest score in the items I05 'Value when a second opinion of another doctor may be needed', I08 'Find information about how to deal with mental health problems, such as stress or depression' and I11 'Value the reliability of the information about risks for health that appear in the media'. These results must be taken into account to reinforce in study plans the topics related to searching for information with a due evaluation of truthfulness and quality. Here the important role played by the Internet in this area should also be highlighted, as it is used by the majority of the population as a tool to obtain information about health topics.[27] Notwithstanding, it should be noted that there is a considerable amount of misinformation circulating on the internet,

so HL is particularly important in educating people with limited capacity to assess the accuracy of this information,[28] particularly considering than some people prefer accessing health information through the Internet rather than asking their healthcare provider.[29]

In our study, the association between the academic year and the HL level was affected by sex.

This relationship was higher and significant for the strata of women, although in the individual analysis there was not a difference by sex in 12 of the 16 items. In other studies, there have been diverse results. While differences by sex were not found in Turkish nursing students,[20] research in Jordan[22] reported better levels of HL in women in some areas which are related with the capacity to find information and how to understand health information. Our study coincided with women being better at seeking information, but men excelled them in tasks of understanding the information that they obtained. Finally, in a Chinese study,[30] it was found that the capacity to obtain, evaluate and understand information in nursing students is not different by sex.

On the relationship between sex and HL, Aldin et al[31] point out that there is a lack of consensus in previous research. While some researchers found a non-significant effect, others suggest that women present a higher level of HL than men. Thus, they[31] explain the existence of different result by the existence of specific factors—such as culture or religion—that may be influencing this relationship. These authors[31] state that men and women have differences in the needs for information on specific health risks, which would affect how it is accessed, understood, evaluated and, in the end, converted into health-promoting behaviour. In this sense, we consider that our findings may favour strategies based on active formative methodology (problem-based learning or flipped classroom) to students at the beginning of their formative period.

In our research, HL levels found in nursing students were limited in the case of first and fourth year students.[16] Various authors[2 4 21] have pointed out that it is necessary to develop specific training in the programme's curriculum combining increasing nursing students HL level and the development of communicative skills to patients in order to enhance HL levels among the general population. This is crucial as it is a question of preparing students to cope with the challenges of providing nursing care in the clinical or community environments, where they

Table 5 Model binary logistic regression for health literacy level at cut off=0.5

Observed		Predicted Level of health literacy Limited	Predicted Level of health literacy Sufficient	Percentage correct
Level of health literacy	Limited	147	42	77.8
	Sufficient	85	50	37.0
Accuracy per cent				60.8

must identify the people who have a limited knowledge concerning health and be able to adapt the information for them, so these people have a better understanding regarding health information, while improving their self-care capacity.[5 32]

Lastly, both individuals and communities must actively engage in the HL process, changing their attitudes and expectations with respect to the traditional model, and getting involved with professional teams, debates and decision-making forums, where future nursing professionals must play an important role in this process. Here, HL mat put forward unique opportunities to guide healthcare and suggest solutions for problems in the health system.[33] This would open a scenario where more diverse health services could thrive and communities' empowerment o will then be achieved, guaranteeing people a greater control concerning their state of health and well-being.[34]

The conclusion of this study is that the HL level in nursing students increases from the first to the fourth academic year. However, although HL level in the fourth year was higher than that in the first year, its was not satisfactory either. Hence, it is recommended to implement intervention strategies that reinforce the curriculum with specific training which combine increasing nursing students HL level and the development of communicative skills, in an effort to ensure that future professionals manage an adequate level of HL to be able to provide care to patients, their families and the community.

Limitations of the study

This study has some limitations. First, the information was obtained by self-reporting and could not be verified by other means, although we believe that the anonymity favoured honest answers to the questionnaire. Second, one limitation is that the study design was cross-sectional, and therefore associations observed do not necessarily establish a cause–effect relationship. Third, there is an imbalance between the number of participants by group (more in the first than in the fourth year) and by sex (more women than men). Therefore, stratified analyses were carried out to control for the confusion effect of gender. Finally, other variables—same level of education, socioeconomic level, presence of work activity, health habits—were not considered in this study. These aspects will be dealt with in further research.

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