

Understanding, Awareness and Associated Factors of Rare Disease among Nursing Undergraduates-Insights from a Cross-sectional Study

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Abstract

Background and Aim: Less common illnesses that are linked to shorter life expectancies are known as rare diseases (RDs). As a result, the purpose of this study was to analyze nursing undergraduates' knowledge and attitudes toward RDs and factors associated with the knowledge of RD. **Methods:** A cross-sectional paper-based study was undertaken among nursing undergraduates at King Saud University from October to December 2023. The self-administered questionnaire comprising 24 questions divided into three sections was used to complete the study aims. The Statistical Package for the Social Sciences version 26.0 (SPSS Inc., Chicago, IL, USA) was used to analyze the data. **Results:** Most students ($n = 270$, 81.6%) were between 18 and 22, while only 61 (18.4%) were 23 and 25 years old. Almost half of them ($n = 170$, 51.4%) had heard about RD, and more than a third ($n = 118$; 35.6%) had encountered someone with RD. According to findings, the most prevalent problems that people with RD have are difficulties in obtaining an appropriate diagnosis (22.1%) and difficulty in finding physicians or treatment centers with experience in an RD (6.6%). Although 27.2% ($n = 90$) of the students reported good levels of knowledge, while 72.8% ($n = 241$) reported poor knowledge of RD. Furthermore, Knowledge was significantly associated with age ($P = 0.049$), level of study ($P = 0.001$), and previous education about RD ($P = 0.001$). The results of multiple linear regression revealed that education level ($B = -0.142$; standard error [SE] = -0.208 ; $t = -3.941$; $P < 0.001$; confidence interval [CI] = -0.213 – -0.071), awareness of the disease ($B = 0.252$; SE = 0.153 ; $t = 2.275$; $P = 0.024$; CI = 0.034 – 0.470), and RD's education status ($B = -0.421$; SE = -0.245 ; $t = -3.670$; $P = 0.001$; CI = -0.646 – -0.195) were predictors of the knowledge. **Conclusion:** According to the current findings, more than half of nursing undergraduates have insufficient knowledge regarding RD. There is an urgent need to promote knowledge about RD among students, since they are future professionals, and teach them about such disorders.

Key words: Attitudes, genetics, knowledge, nursing students, rare disease, Saudi Arabia

INTRODUCTION

Rare diseases (RDs) are conditions that are less common in humans and are linked to shorter lifespans.^[1-3] Between 1 in 2000 and 5 in 10,000 people are estimated to have an RD.^[2,3] Furthermore, recent estimates indicated that 400 million people globally were impacted by RDs.^[4] Moreover, past studies indicate that children comprised half of the overall population affected by RD.^[4] Approximately 10% of Americans suffer from RD.^[4] The literature from the Middle East indicates that there are 2.8 million people with RD, making it the world with the highest prevalence rates of RDs.^[5,6] According to the

most recent data, 302 cases of RD have been documented in Iran,^[7] many of which have not yet been the focus of medical investigation.^[1,2,5-7] Three of the 10 children had greater rates of RD, which reduced their life expectancy to 5 years.^[4,8] Global Genes estimate that 10,000 different RD types are

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presently common worldwide.^[4,9] Remarkably, the majority of RDs do not yet have Food and Drug Administration-approved drugs for therapy.^[4,9] In addition, the diseases were characterized by a typical diagnostic criteria, which was estimated to be between 6 and 8 years.^[4,9]

The prevalence of RDs differs substantially between countries; some can be treated or prevented, but most reduce life expectancy and result in early death.^[2,8,10] Although the precise etiology of RDs remains unknown, extant literature suggests that genetic mutations that cause RDs are a hereditary trait that is passed down from one generation to the next.^[11] Conversely, one of the causes of RDs is consanguineous marriages as well as older mother and paternal ages.^[6] According to the National Human Genome Research Institute, environmental factors, such as nutrition, smoking, and toxin exposure can have an impact on diseases.^[5,12,13] These variables have the potential to induce disease directly or to compound pre-existing problems in conjunction with inherited factors.^[13] In addition, higher rates of consanguineous marriages and advanced maternal and paternal age were another potential cause of RDs.^[5] The literature claims that RD is typified by a loss of autonomy coupled with excruciating pain that unsettles the patient and causes suffering for the entire family.^[14] In addition, the patient's quality of life is disrupted by the severity of the can.^[14]

Compared to medicine, nursing requires more attention and more time for studying extracurricular activities, yet nursing practitioners are in high demand due to their other excellent roles with physicians. Most diseases arise immediately after birth and nurses play a vital role in many parts of patient care from birth to discharge.^[15,16] Nurses are also required to know the diagnostic procedures of inborn disorders and to participate in postnatal diagnostic testing. Furthermore, identifying RD is challenging and many healthcare professionals are unfamiliar with it, nurses are frequently the initial point of contact with RD patients and their families, they understand that listening to RD patients may be the only tool available for diagnosis.^[16,17] Furthermore, nurses play an important part in the overall process of caring for and assisting RD patients and their families in dealing with the diagnosis. Therefore, posing adequate knowledge and awareness about RD is crucial among nurses and other healthcare professionals.

Previous research has found that RD knowledge is typically considered inadequate among physicians and other healthcare professionals.^[1,7,13] The majority of them believed their academic expertise was insufficient and unsuitable for diagnosing RDs in everyday practice.^[1,7,16] While physicians are responsible for managing the care processes of patients with RDs, the role of other healthcare professionals, including nurses and physiotherapists, is increasing in patient counseling and disease management. As a result, there is a need to increase knowledge and awareness of RD is evident among healthcare professionals, such as nurses.^[5] Inadequate, knowledge, awareness, and attitudes were considered one of the most common factors among healthcare professionals

more particularly among nurses, leading to this disease.^[7] Unfortunately, no study with a similar purpose was found in Saudi Arabia, however, one study in Iran revealed limited knowledge of healthcare students toward RD. Therefore, the purpose of this study was to analyze nursing undergraduates' knowledge and attitudes toward RDs and factors associated with the knowledge of RD.

METHODS

Study design, setting, and participants

A cross-sectional paper-based questionnaires-based study was executed among nursing undergraduates at King Saud University (KSU) from October to December 2023. Students over the age of 18, willing to provide informed consent, and were currently enrolled in level three or higher at KSU's College of Nursing were included. However, students from other disciplines, junior students pursuing level one, or two, who are not regular to the college, students who are outside of the country, and students who did not match the eligibility requirements were excluded. Furthermore, the Ethical Committee College of Medicine at KSU reviewed and approved the study procedure and questionnaires before data collection (Reference number 712-2023, issued in September 2023). Furthermore, informed consent was obtained before data collection, and students were informed that the data they provided would be used solely for research motives and that the data's anonymity would be preserved throughout the study. Finally, students were informed that they might withdraw from the study at any point during the study period.

The sample size was estimated using the Raosoft online calculator.^[18-26] The required sample size was computed at a 95% confidence level (CI) using a 50% assumed response distribution, a population of 500 university students, and a 5% margin of error (ME). The acceptable sample size was 218 [Scheme 1]. However, to minimize missing responses and to reach the largest number of students, we decided to approach at least 350 students.

The questionnaire was developed by the authors, based on previously published research, and tailored to the current population.^[1,7] The self-administered questionnaire consisted of 20 items with multiple choice and binary answers (Yes/No), separated into three sections.^[1,7] The initial section sought to collect socio-demographic information about the students, such as age, nationality, level of education, and basic knowledge about RDs.^[1,7] The second contained questions about students' responses about encountering someone with RD, a family member or relative who has RD, and typical RD examples, and is RD treatable (5-items), such as if they had met a person or a family member who had RD, whether they knew it was treatable, and instances of difficulties associated with RDs.^[1,7] The third portion discusses the students' understanding and includes four multiple-choice questions.

The last section of the study focused on students' attitudes toward RDs and included six questions, in addition there was one question about the most common source of RDs.^[1,7]

Before starting the study, the questionnaire was validated. First, a field research professional reviewed the questionnaires to ensure accuracy and flow of the content. Second, a pilot study was done with a randomly selected sample of 30 nursing students to gather feedback, determine the feasibility of the study, and pre-test the questionnaire. The reliability test was performed by calculating Cronbach's alpha using the Statistical Package for the Social Science, which was 0.72, for all three domains, indicating that questionnaires are reliable and valid for conducting the study. The Cronbach's alpha for knowledge, attitudes, and aspects of RDs (example and encountering individuals) was presented in Figure 1.

The data from the pilot study were not included in the final analysis. Data collection was carried out using the simple random sampling strategy; for this, a researcher was recruited and contacted the students with the assistance of a group leader in each class. The questionnaires were distributed to all students present at the time, and they were briefed about the study's aims and given enough time to complete. Furthermore, a researcher was followed with the data collection. The data were collected until the required sample was obtained.

Data analysis

First, the data were transferred from Microsoft Excel 2016 to the IBM Statistical Package for the Social Science Statistics

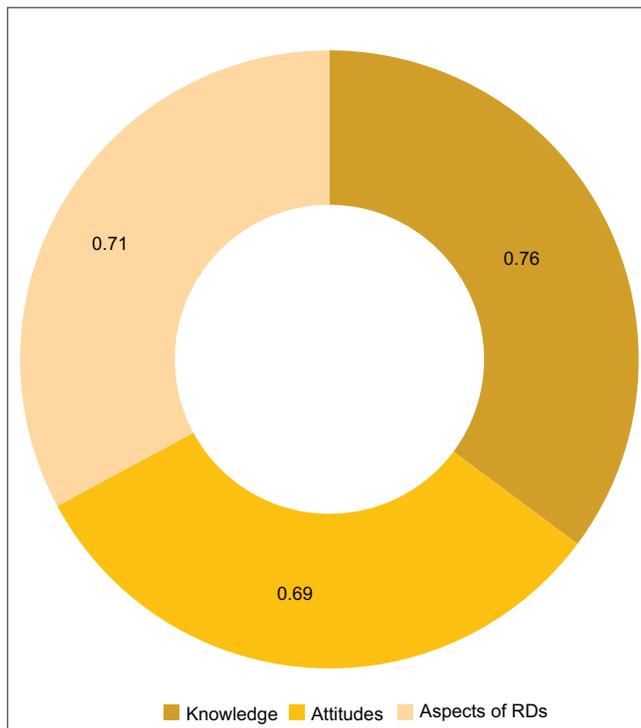


Figure 1: The Cronbach's alpha for knowledge, attitudes, and aspects of RDs.

version 28.0 software (IBM Corp Armonk, NY, USA) and analyzed. Descriptive statistics were used, and the dataset (demographic characteristics, knowledge, and attitudes of healthcare students) were presented as frequencies (*n*) and percentages (%). The level of knowledge was computed from four questions. A correct answer was assigned 1 point, while an incorrect answer was given zero. Then, the mean score was computed by combining all the knowledge items and it is further divided into good and poor knowledge levels. A Chi-squared test and a Fisher's exact test were performed to determine the association of demographic characteristics with students' knowledge levels toward RD. In addition, multivariate linear regression analysis was performed to find out the predictors of knowledge score of RD. A $P < 0.05$ was considered statistically significant.

RESULTS

A total of 331 nursing students responded to the study by giving a response rate of 94.57% ($n = 350$). The majority of students ($n = 270$, 81.6%) were between the ages of 18 and 22, while only 61 (18.4%) were between the ages of 23 and 25. Almost all students ($n = 314$, 94.9%) stated that they were nationals. In terms of the study level, students had an equal frequency in the level four and six (38.4%), with only ($n = 50$; 15.1%) of the students in the fifth level. As illustrated in the Table 1.

Table 2 displays the results of the student's awareness of RD. Almost half of the students ($n = 170$; 51.4%) said they had

Table 1: Demographic characteristics of the undergraduate nursing students ($n=331$)

Variables	Frequency	Percentage
Age		
18–22	270	81.6
23–25	61	18.4
Nationality		
Saudi	314	94.9
Non-Saudi	17	5.1
Level of education		
Level-3	39	11.8
Level-4	112	33.8
Level-5	50	15.1
Level-6	112	33.8
Level-7	14	4.2
Level-8	4	1.2
Received any courses or earlier education about RD?		
Yes	113	34.1
No	218	65.9

RD: Rare disease

heard of RD, and more than a third ($n = 118$; 35.6%) said they had encountered someone with RD. Nonetheless, only about 29% of the student's family members had RD. According to findings genetics ($n = 135$; 40.8%) was the most prevalent cause of RD, followed by infectious and bacterial ($n = 90$; 27.2%), mitochondrial ($n = 20$; 6%), and autoimmune (4.8%). More than half of the students (58.9%) believed RD could be treated. In addition, students revealed that neonates (23.3%), children (22.7%), and teenagers (12.3%) were the most often encountered age groups by the RD.

In terms of identification of RDs, 36% of the students reported child syndrome, 30.8% psychiatric, and 13.0% of were identified with sickle cell anemia. The most prevalent issues that people with RDs have are difficulties in obtaining an appropriate diagnosis (22.1%), followed by limited treatment options (15.4%), decisions made by people who are unfamiliar with the disease, and difficulty in finding physicians or treatment centers with experience in a specific disease ($n = 22$; 6.6%) [Figure 2]. Almost one-third of the students

Table 2: Students responses about encountering someone with RD, a family member who has RD, and typical RD examples ($n=331$)

Variables	Frequency	Percentage
Have you ever met a person suffering from RD?		
Yes	118	35.6
No	158	47.7
I don't know	55	16.6
Is anyone in your family suffering from RD?		
Yes	96	29
No	173	52.3
I don't know	62	18.7
Do you think RDs can be treatable?		
Yes	195	58.9
No	51	15.4
I don't know	85	25.7
RDs identified by students		
Psychiatric	102	30.8
Child syndrome	119	36
Sickle cell anemia	43	13
Hemophilia	16	4.8
Cystic fibrosis	10	3
Spinal muscular atrophy	13	3.9
Urological	8	2.4
Orthopedic diseases	20	6

RD: Rare disease

(28.7%) agreed that Saudi Arabia had a central registration of RD patients. More than one-third of the students (32.3%) believed that Saudi Arabia has a national plan for RD.

Table 3 shows the knowledge about RD of the students. However, more than half of them answered certain items incorrectly more than correctly. For instance, 40.8% of the students answered correctly on items concerning the (1) main cause for RD ($n = 135$), (2) the age group in which RDs most commonly occur (22.7%; $n = 75$), item (3) the existence of a central register of RD patients in Saudi Arabia (28.7%;

Table 3: Knowledge of students about the RD ($n=331$)

Variables	Frequency	Percentage	Correct answer n (%)
What is the most common cause of RDs?			
Bacteria	90	27.2	40.8
Genetics	135	40.8	
Autoimmune diseases	16	4.8	
Mitochondrial	20	6	
Environmental	9	2.7	
I don't know	61	18.4	
At what age group do RDs most frequently appear?			
Newborns	77	23.3	22.7
Children's	75	22.7	
Adolescents	33	10	
Adults	29	8.8	
Present in all age groups equally	32	9.7	
I don't know	85	25.7	
Is there a central register of RD patients in Saudi Arabia?			
Yes	95	28.7	28.7
No	76	23	
I don't know	160	48.3	
Is there a national plan for RDs in Saudi Arabia?			
Yes	107	32.3	32.3
No	49	14.8	
I don't know	175	52.9	

RD: Rare disease

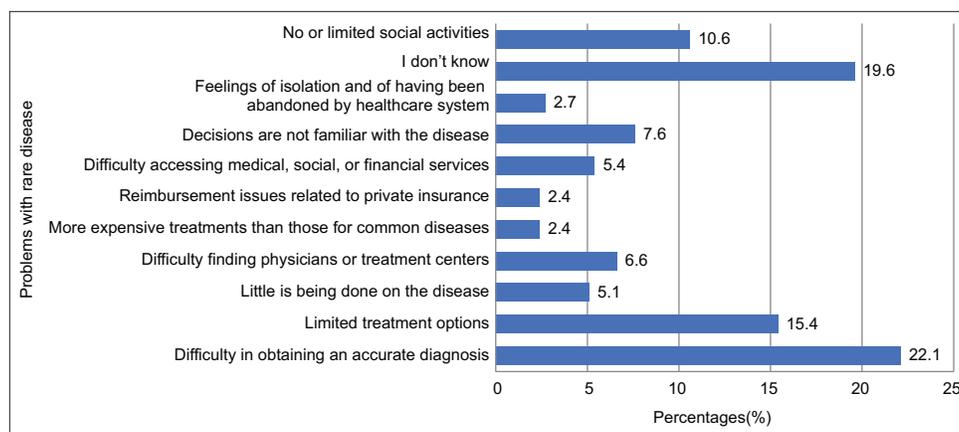


Figure 2: The most common difficulties faced by individuals with rare diseases.

$n = 95$), (5) and finally, is there a national plan for RDs in Saudi Arabia (32.3%; $n = 107$). The details on frequency per item of knowledge about the RD of the studied population can be seen in Table 3.

Table 4 depicts students' attitudes toward the RDs. According to the questionnaire, 50.5% of the students believe RD is a critical public health issue, 42.9% believe their understanding of RD is very good, and 41.1% believe family practitioners should be particularly trained about RD. In contrast, more than half of the students (54.4%) believed that RD should be a required topic in their medical curriculum. Furthermore, 43.2% of students felt equipped to care for an RD patient.

The source of knowledge regarding RD was mandatory university courses (20.5%), followed by scientific literature and research (17.8%), facultative university courses, and others (9.7%), and 27.2% did not search for such information [Figure 3].

The mean RD scores and distribution among students were assessed [Table 5]. The findings showed an average score of $0.96 \pm (1.00)$ (min = 0.00, max = 4.00, $n = 331$). About the distribution of RD scores per item, the highest score was found for item 1 (40.2%; $n = 133$), while the lowest was found in item 4 (0.6%; $n = 2$).

In this study, 27.2% ($n = 90$) of the students reported good levels of knowledge about RD, while 72.8% ($n = 41$) reported poor knowledge of RD as shown in Figure 4.

Finally, the association between knowledge levels against factors, such as age, nationality, level of education, awareness, previous education, and family history of RD was determined using the Chi-square/Fisher exact test at <0.05 level [Table 6] The results revealed that only the nationality of the students had no significant association with knowledge levels ($P = 0.142$), implying that nationality is not a major predictor of knowledge level. Other comparisons, such as knowledge levels and level of study, age, and receiving courses or earlier education, revealed a significant association ($P = 0.001$).

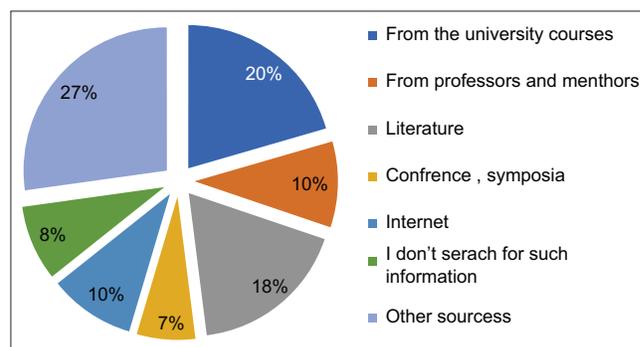


Figure 3: Source of knowledge about rare diseases.

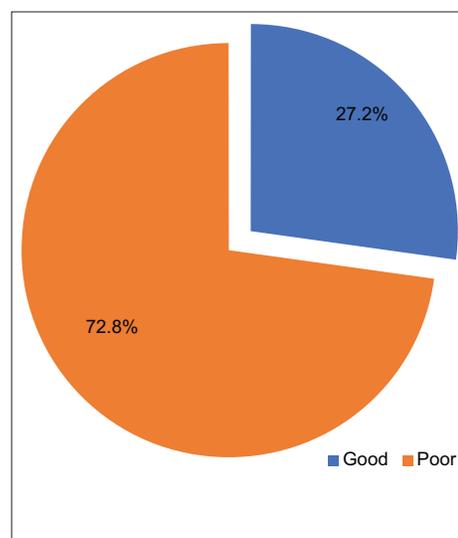


Figure 4: Level of knowledge of rare disease.

A multiple regression linear model was used to establish the relationship between the RD knowledge and student factors, such as age, gender, nationality, level of study, awareness of disease, and receiving courses or earlier education about RD. The dependent variable was knowledge of RD, and the explanatory variables were age, gender, nationality, level of study, awareness of disease, and receiving courses or earlier education. Multiple linear regression analysis results showed that there was a significant relation between the knowledge of RD, an education

Table 4: Attitude of students toward RD ($n=331$)

Variables	Frequency	Percentage
Does RD constitute a serious public health issue?		
Yes	167	50.5
No	63	19
I don't know	101	30.5
Which physicians should be uniquely trained in RDs?		
Family physician	136	41.1
Pediatrician	52	15.7
Neurologist	36	10.9
Geneticist	63	19
Psychiatrist	16	4.8
Immunologist	28	8.5
How would you rate your knowledge about RDs?		
Very good	142	42.9
Fair enough	107	32.3
Very poor	82	24.8
Would you like to broaden your knowledge about RDs?		
Yes	162	48.9
No	86	26
I don't know	83	25.1
Do you think that there should be a mandatory course on RDs in medical curricula?		
Yes	180	54.4
No	93	28.1
I don't know	58	17.5
Do you feel prepared for caring for a patient with a RD?		
Yes	143	43.2
No	116	35
I don't know	72	21.8

RDs: Rare diseases

level ($B = -0.142$; standard error [SE] = -0.208 ; $t = -3.941$; $P < 0.001$; CI = $-0.213-0.071$), awareness of the disease ($B = 0.252$; SE = 0.153 ; $t = 2.275$; $P = 0.024$; CI = $0.034-0.470$), and receiving courses or earlier education status ($B = -0.421$; SE = -0.245 ; $t = -3.670$; $P = 0.001$; CI = $-0.646-0.195$) as shown in Table 7. All other variables were significantly not associated with the use of ChatGPT as shown in Table 7.

DISCUSSION

A RD is a persistent inherited ailment that impacts a considerable proportion of the global populace.^[6,27,28] This

Table 5: Mean knowledge about RD and scores and distribution among the studied population ($n=331$)

Score	<i>n</i>	Min	Max	Mean (Median)	SD
Knowledge about RD	331	0.00	4.00	0.96 (1.00)	0.815
				Count (<i>n</i>)	Percentage (%)
Knowledge about RD		0	108		32.6
		1	133		40.2
		2	86		26.0
		3	02		0.6
		4	02		0.6
Total				331	100.0

RD: Rare disease

condition may be persistent and incurable, with complicated symptoms that may appear in any part of the body.^[27,28] In addition, allergies, chromosomal issues, proliferative and degenerative disorders, bacterial or viral infections, and other factors can all lead to RDs. Healthcare providers from various specialties must work together to manage diseases in a multidisciplinary manner to provide patients with the best health outcomes.^[5,6,27,28] Nurses play an important role in this process since they are in charge of ensuring that patients receive the correct medication and counseling and that their medications are optimized to effectively manage their illness. As a result, nursing students must have a good foundation of RD knowledge awareness and attitudes, therefore, this study was conducted to analyze the degree of knowledge and attitude among nursing students to detect any potential gaps in their understanding of RD.

According to the findings, 27.2% of students had adequate knowledge of RD, while the majority (72.8%) of them reported poor knowledge. These findings are consistent with the earlier findings conducted in Iranian among future healthcare professionals and in Poland among nursing, physiotherapy, and medical students.^[1,7] For instance, a recent study in the Iranian context by Jahanshahi *et al.*, in 2022 revealed that 85% of nursing students reported very limited knowledge about RD.^[7] Similarly, another study by Domaradzki and Walkowiak in 2021 shows that over 95% of student nurses, physiotherapists, and physicians lacked knowledge of RD.^[11] In addition, an earlier study also found that 92% of medical students, and 84% of physiotherapy and nursing students, did not feel prepared for caring for RD patients.^[11]

Similar to previous studies,^[1,7,29] the findings from the current study showed that only 34.1% of the students received education or courses about RD. These findings were somewhat similar to previous findings by Jahanshahi *et al.* among Iranian students, and by Walkowiak and Domaradzki among nursing students^[7,16] who reported that the majority of the nursing students were aware of the term RD.^[7]

Table 6: Association between the knowledge levels about RD against demographics characters among the studied population ($n=331$)

Variable	Number of students	Knowledge levels		P-value
		Good n (%)	Poor n (%)	
Age				
18–22	Students	79	191	0.049
	% within age	29.3	70.7	
	%within knowledge categories	87.8	79.3	
23–25	Students	11	50	
	% within age	18.0	82.0	
	%within knowledge categories	12.2	20.7	
Nationality				
Saudi	Students	88	226	0.142
	% within nationality	28.0	72.0	
	%within knowledge categories	97.8	93.8	
Non-Saudi	Students	02	15	
	% within nationality	11.8	88.2	
	%within knowledge categories	2.2	6.2	
Level of education				
Level-3	Students	12	27	<0.0001
	% within the level of education	30.8	69.2	
	%within knowledge categories	13.3	11.2	
Level-4	Students	58	54	
	% within the level of education	51.8	48.2	
	%within knowledge categories	64.4	22.4	
Level-5	Students	14	36	
	% within the level of education	28.0	72.0	
	%within knowledge categories	15.6	14.9	
Level-6	Students	06	106	
	% within the level of education	5.4	94.6	
	%within knowledge categories	6.7	44.0	
Level-7	Students	0	14	
	% within the level of education	0	100.0	
	%within knowledge categories	0	5.8	
Level-8	Students	2	4	
	% within the level of education	0	100.0	
	%within knowledge categories	0	1.7	
Have you received any courses or earlier education about RD?				
Yes	Students	51	62	<0.0001
	% within received any courses about RD	45.1	54.9	
	%within knowledge categories	56.7	25.7	
No	Students	39	179	
	% within received any courses about RD	17.9	82.1	
	%within knowledge categories	43.3	74.3	
History of anyone in the family suffering from RD?				
Yes	Students	44	52	<0.0001
	% within families suffering from RD	45.8	54.2	
	%within knowledge categories	48.9	21.6	

(Contd...)

Table 6: (Continued)

Variable	Number of students	Knowledge levels		P-value
		Good n (%)	Poor n (%)	
No	Students	34	139	
	% within families suffering from RD	19.7	80.3	
	%within knowledge categories	37.8	57.7	
I don't know	Students	12	50	
	% within families suffering from RD	19.4	80.6	
	%within knowledge categories	13.3	20.7	

RD: Rare disease

Table 7: Multivariate linear logistic regression analysis of nursing students' demographic and their knowledge of RD

Variables	Unstandardized coefficients		Standardized coefficients	t	Sig.	95.0% confidence interval for B	
	B	Std. error	Beta			Lower bound	Upper bound
(Constant)	2.195	0.335		6.561	<0.001	1.537	2.854
Age	-0.010	0.122	-0.005	-0.080	0.936	-0.251	0.231
Nationality	0.058	0.227	0.016	0.254	0.800	-0.389	0.504
Level of education	-0.142	0.036	-0.208	-3.941	<0.001	-0.213	-0.071
Receiving courses or earlier education	-0.421	0.115	-0.245	-3.670	<0.001	-0.646	-0.195

Dependent variable: Knowledge score. RD: Rare disease

Walkowiak and Domaradzki's study revealed that only 13% of students had taken university courses and a significantly greater percentage (about 85% of nurses and about 75% of students) believe that these courses are necessary.^[16] While 85% of nursing students feel unprepared to care for patients with RDs and are not at all confident about their level of readiness.^[16] These findings suggest that the students need additional education through extracurricular activities during their studies. In many universities education system varies, and student's attendee different lectures, and may compelled courses, offered as a part of their university curriculum, including basic genes and genetics along with other major subjects. Although We hypothesize that nursing students learn the knowledge of RDs randomly and casually. The lower knowledge of RDs might be because RDs are not taught as a separate subject and in a systematic comprehensive form, suggesting incorporating the RD course in every health care curriculum.

In this study, 30.8% of the students identified Psychiatric disease as the RD, followed by child diseases 36%, sickle cell anemia 13%, hemophilia, cystic fibrosis, and spinal muscular atrophy. While the previous study by Jahanshahi *et al.* in 2022 revealed that Sickle cell anemia (30.2%), Marfan syndrome (28.6%), Gaucher disease (28%), Pompe disease (10.5%), and Osteogenesis imperfecta (9.9%) were the most commonly identified diseases by students.^[7] Similarly, another recent study among future healthcare professionals revealed

nursing students identified sickle cell anemia, followed by cystic fibrosis, Marfan syndrome, Osteogenesis imperfecta, Fragile X syndrome, Hemophilia, and Neurofibromatosis as common RDs.^[1] However, the percentages of correct answers in the recognition of the RD were limited in the current and previous studies.^[1,7] Lack of recognition of RDs from other diseases may lead to unsatisfactory treatment outcomes, disturbed quality of life of the patients, and increased health care costs. Furthermore, earlier studies also revealed that a lack of knowledge in the recognition of RD results in misdiagnosis and delayed treatment.^[7] Since students are going to be practicing professionals in the future, they must receive education from graduation onward. This will help them not only get top marks in school but also improve patient outcomes in their practice.

In this study, there was a statistically significant association between knowledge level and age of the students, family history of RD, and previous education about RD. Furthermore, knowledge was significantly associated with the level of education. However, the nationality of the nursing undergraduates had no significant effect on their knowledge levels of RD. Studies examining the variation between knowledge levels of RD and characteristics of undergraduate nursing students are currently lacking. However, one study reported that final-year medical students felt better prepared to care for RD patients than those studying in the 2nd or 3rd year. Nevertheless, 6th-year students did not answer better than

their younger colleagues, indicating a significant association between the RD knowledge and year of study.^[1] There have been some studies on the evaluation of RD knowledge and attitudes among healthcare students.^[1,7] Those earlier studies looked at the relationship between the knowledge score and the students' profession and found no significant difference in the knowledge and attitudes of nursing, medical, and other students.^[7] The fact that students consistently display a higher level of stress and study burden for numerous disciplines. Furthermore, the lack of additional courses on various diseases during graduation may have contributed to the lesser knowledge among the investigated group.

This study provides new information about nursing students' knowledge of RDs in Saudi Arabia, which can be used as a reference for upcoming studies both nationally and internally. However, this study has limitations. First, because only nursing students from a single university in Riyadh were included, therefore the results may be difficult to generalize to the overall nursing student population in Saudi Arabia. As a result, a more in-depth study would be required to assist in elucidating the challenges surrounding RD education among healthcare students in Saudi Arabia. However, several advantages of this study should be recognized. Most importantly, because RD appears to be disregarded by health education, the incidence was found much higher in gulf countries, and there is a scarcity of previous studies on the topic, it sheds some light on nursing students' understanding and attitudes of RD. Hopefully, this study will not only spark further research on the problem but also start a conversation about the need for improved RD education for future healthcare workers.

CONCLUSION

According to the current findings, more than half of nursing undergraduates have insufficient knowledge regarding RD. There is an urgent need to promote knowledge about RD among students since they are future professionals who counsel and manage the diseases of their patients. It is of particular importance because the majority of the students did not attend any RD courses, and half of the students did not believe that RD was a significant public health issue. Students agreed to broaden their knowledge in this area, and thus they should be well educated in this area.

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AUTHORS' CONTRIBUTIONS

NA, WS, AB, SB, collected the data and wrote the manuscript. SB, AB, WS analyzed the data and

DATA AVAILABILITY

All relevant data are available from the corresponding author upon request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

All methods were performed in accordance with the Declaration of Helsinki. Informed consent has been obtained from all participants before data collection. Ethical approval was obtained from the Ethics Committee for Human Research at King Saud University, Riyadh, Saudi Arabia (Institutional Review Board no. KSU-HE-23-712).

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