



Knowledge, Attitude, and Practice Regarding Voluntary Blood Donation among Allied Health Students: A Descriptive Correlational Study

Mohammad Etoom, RN, MSN, PhD^{1*}; Rafi Alnjadat, RN, MSN, PhD¹; Laila Akhu-Zaheya, RN, MSN, PhD²;
Eshraq Al-Momani, RN, MSN¹; Loai Alfarajat, RN, MSN, PhD¹

¹ Department of Applied Health Sciences, Irbid University College, Al-Balqa Applied University, Irbid, Jordan.

* Corresponding Author. Email: Maetoom@bau.edu.jo

² Dean of Faculty of Nursing, WHO Collaborating Center, Jordan University of Science and Technology, Irbid, Jordan.

ARTICLE INFO

Article History:

Received: February 14, 2025

Accepted: April 28, 2025

ABSTRACT

Background: The availability of voluntary blood donors is a serious concern, particularly in low- and middle-income nations, due to a significant shortage of safe blood supply compared to anticipated demand. However, there is insufficient information regarding voluntary blood donation (VBD) knowledge, attitude, and practice in the current study area. **Purpose:** This study aims to assess the knowledge, attitude, and practice regarding voluntary blood donation among allied health students and determine the most influential factors. **Methods:** A descriptive, correlational, cross-sectional research design was utilized, employing an online self-administered questionnaire. The study sample consisted of 246 allied health students, selected through a non-probability convenience method. The translated knowledge, attitude, and practice instrument was used to assess the students' knowledge, attitude, and practice regarding voluntary blood donation. Data was analyzed using the Statistical Package for Social Sciences (SPSS; Version 27), with a statistical significance value of $p < 0.05$. **Results:** The total number of participants in this study was 246 students. More than a half of students ($n=146$, 59.5%) exhibited good knowledge regarding VBD, and the majority of students had good attitude regarding VBD ($n= 230$, 93.6%), while only a small portion ($n= 66$, 26.8%) previously participated in the practice of VBD. There is a significant weak positive relationship between age and knowledge regarding VBD ($r = 0.186$, $p = 0.003$). Also, there are statistically significant differences between gender, smoking status, academic program, and knowledge regarding VBD ($t = -3.44$, $p = 0.001$; $t = -2.53$, $p = 0.012$; $F = 4.75$, $p = 0.003$, respectively). Furthermore, there is a significant moderate negative relationship between gender, smoking status, and practice regarding VBD (AOR=0.210, CI= 0.095-0.463, $p<0.001$; AOR= 4.085, CI= 1.672-9.983, $p = 0.002$, respectively). **Conclusion:** The findings indicate that while more than a half of participants had adequate knowledge (59.5%), and good attitude (93.6%) regarding VBD, while only a small portion (26.8%) previously participated in the practice of VBD. Also, there is a significant weak positive relationship between age and knowledge regarding VBD. In addition, there are statistically significant differences between gender, smoking status, academic program and knowledge regarding VBD. Furthermore, there is a significant relationship between age, gender, smoking status and practice regarding VBD. **Implications for Nursing:** The findings emphasize the need for a comprehensive strategy encompassing educational campaigns designed to raise knowledge and awareness regarding VBD, while also promoting active participation.

Keywords: Knowledge, Attitude, Practice, Voluntary, Blood donation, Allied health students.

What does this paper add?

1. Voluntary blood donation is a crucial component of modern healthcare, saving millions of lives yearly and improving quality of life.
2. Inadequate blood donation advertising strategies, ambiguous information about the health effects of blood donation, and a lack of awareness regarding blood donation locations could lead to poor practice of voluntary blood donation.
3. Comprehensive and specific health information should be offered regarding the requirements for eligibility, the risks and health benefits of blood donation, the volume of blood donated, the number of patients who benefit from a single blood donation, and the significance of blood in preserving human lives.

Introduction

Human blood is an essential element of existence, and there are yet no alternatives for its components (Ahmed et al., 2023). It is a liquid connective tissue synthesized through natural processes that the body requires for oxygen transport, nutrient and hormone delivery, eliminating waste products, and defending against infections (Eltewacy et al., 2024; Ghosh et al., 2024). Since artificial blood synthesis is still impossible and not feasible despite tremendous advances in science and technology, blood and its components can only be obtained through blood transfusion (Martínez-Santos et al., 2021).

Blood transfusion is a crucial component of modern healthcare, saving millions of lives yearly and improving quality of life (Salem et al., 2024). The need for blood transfusion has grown in recent decades due to several factors, including the rise of violence and accidents, technological advancements in the performance of extremely complex therapeutic procedures, the aging of the population, and the high incidence and prevalence of chronic diseases and conditions, such as cancers, congenital/acquired hematological diseases, bleeding disorders, pregnancy-related complications, trauma, and surgeries (Hossain et al., 2022; Miriane et al., 2020). However, blood and blood product shortages brought on by low blood donation rates can have substantial consequences for patients in need, cause medical treatments to be delayed or canceled, and hinder patient care (Salem et al., 2024). In this regard, there is a necessity for providing safe,

secure, and accessible blood donation, particularly in low-and middle-income countries (LMICs; Elteuacy et al., 2024; Miriane et al., 2020).

Voluntary blood donation (VBD) is a non-remunerated procedure by which an eligible volunteer donates his or her blood, plasma, or cellular components for transfusion to those in need without receiving payment (Alsarafandi et al., 2023; Ezeldain et al., 2020). There are several kinds of blood donors, including volunteer, replacement, paid, and family donors (Saeed et al., 2024). Hospital replacement donors provide the bulk of blood donation in several nations when a friend or a relative is in need (Eltewacy et al., 2024). Nevertheless, the most effective, most sustainable, and safest method of meeting the nation's blood transfusion needs is VBD, since voluntary blood donors are not enticed to give misleading information to donate, and they have the lowest rate of transfusion-transmissible infection (Beyene, 2020; Hossain et al., 2022; Kayastha et al., 2022). Therefore, the World Health Organization (WHO) advocates for 100% voluntary blood donation to guarantee a stable and secure supply of blood (WHO, 2010).

The whole blood donation rate and percentage are reliable measures of the overall blood supply in a country (Mussema et al., 2023). The WHO advises that to fulfill the basic need for blood and blood products, at least 1% of the country's population should voluntarily donate blood (WHO, 2010, 2023). It was estimated that 118.5 million blood donations are collected annually worldwide (WHO, 2023). The median rate of blood donations varies significantly across different income classifications of countries. However, there is an extensive gap between the demand and supply of blood and its components, especially in LMICs (Khadilkar et al., 2022). The median rate is observed to be 31.5 donations per 1000 individuals in high-income countries, 16.4 donations per 1000 individuals in upper-middle-income countries, 6.6 donations per 1000 individuals in lower-middle-income countries, and 5.0 donations per 1000 individuals in low-income countries (WHO, 2023). In Jordan, about 250,000 blood donations were made in 2023 (Omaish et al., 2024). The frequency is 21.5% per 1000 individuals, falling between high- and low-income nations. Since patients are expected to require over 360,000 blood donations annually, this amount of contribution is insufficient to meet their needs (Omaish et al., 2024). Therefore, there is a continuous

global effort to keep enough voluntary blood donors to provide a fast, safe, and sufficient blood supply that can meet clinical demand (Ahmed et al., 2023; Mugion et al., 2021).

VBD is the main source of blood donation that primarily depends on the knowledge, attitude, and practice (KAP) of the general population, including allied health students (Ghosh et al., 2024; Neupane et al., 2022). Knowledge about the significance, advantages, safety, and eligibility requirements of blood donation is essential to fostering favorable attitudes and practices toward VBD (Ogundeji et al., 2021). Also, blood donation rates can rise when people have a favorable attitude regarding VBD (Beyene, 2020). In addition, both knowledge and attitude frequently have an impact on VBD practice (Mussema et al., 2024). However, potential donors may be discouraged by poor knowledge, lack of understanding and awareness, negative attitudes toward donation, misconceptions regarding eligibility criteria and health hazards, lack of motivation, pain, fear of donating blood and infections, and fear of needles (Ghosh et al., 2024; Khan et al., 2024; Kocic et al., 2024; Miriane et al., 2020; Mussema et al., 2024). Given the general lack of reports on KAP regarding VBD in Jordan, comprehensive studies in this area are essential. These studies are imperative before initiating efforts to enhance population awareness and foster positive attitudes toward blood donation within the country (Omaish et al., 2024).

Various socio-demographic factors, including age, sex, academic level, academic year, residence, family monthly income, religion, and previous blood donation, were the most commonly mentioned independent factors affecting KAP regarding VBD (Ahmed et al., 2023; Khan et al., 2024). However, it should be highlighted that because various communities have different perspectives and differ in cultural, educational, and socio-economic aspects, findings from one study may not necessarily apply to all populations (Omaish et al., 2024). Consequently, determining socio-demographic factors affecting KAP regarding VBD among allied health students is of paramount importance.

Young adults make up a large percentage of the population, and they represent the future and present resource of a safe and sustainable blood supply, since they are generally healthy, active, and well-educated (Kayastha et al., 2022). Allied health students, who make up a large proportion of young adults, can assist in

alleviating the scarcity of blood by serving as a readily available group for VBD (Babker et al., 2024). Also, they act as community role models and motivators by raising awareness and encouraging healthy populations to donate blood, thus decreasing the gap between demand and supply of blood (Javaeed et al., 2020; Yosef et al., 2021). Additionally, they are future healthcare providers and will play a valuable role in decision-making in their work (Miriane et al., 2020). To the best of our knowledge, there is limited information concerning KAP regarding VBD and related factors in the context of the present study. Therefore, this study aims to assess the knowledge, attitude, and practice regarding voluntary blood donation among allied health students and determine the most influential factors.

The proposed study is supposed to fill the knowledge gap in the literature by raising our understanding of the level of KAP regarding VBD among allied health students in Jordan. Also, the results would increase the awareness of university academic staff in terms of the requirements to improve the level of KAP regarding VBD. Additionally, it could help universities and healthcare agencies to develop interventional programs that increase knowledge and practice of VBD among allied health students. Furthermore, the findings could help policymakers create policies that will increase blood donation rates across the country. Therefore, this study bridges the gap between blood supply and demand, eventually saving lives and enhancing health outcomes across Jordan.

Research Questions

1. What's the level of knowledge, attitude, and practice regarding voluntary blood donation among allied health students?
2. What are the influential factors affecting knowledge, attitude, and practice regarding voluntary blood donation among allied health students?

Methods

Design and Setting

A descriptive, correlational, cross-sectional design was utilized in the current study to assess the knowledge, attitude, and practice regarding voluntary blood donation among allied health students and determine the most influential factors. This design was employed due to its alignment with the study aims, since it allows the description of study variables and determines the

correlation between them, and due to its ability to efficiently collect data from a large sample within a short time frame and a single point of time (Etoom et al., 2024; Mussema et al., 2024).

The study was carried out in Jordan at Al-Balqa Applied University, Irbid University College, within the Applied Health Sciences Department among allied health students. Irbid University College is located in northern Jordan, in Irbid Governorate, and is about 90 km away from the capital, Amman. This college has six departments, one of which is the Department of Applied Health Sciences. This department currently has an enrolment of over 1150 students distributed across four specializations: nursing, midwifery, pharmacy, and physiotherapy. Focusing on the current allied health sciences students at Irbid University College facilitates the acquisition of localized insights, which can bridge existing gaps in the current literature and inform the development of comprehensive strategies aimed at improving blood donation initiatives.

Sampling

The study participants were recruited using a non-probability convenience sampling method. This method was chosen, since it was found applicable, cost-effective, and required minimal time to gather participants (Golzar et al., 2022). Study inclusion criteria were students being current allied health students who were able and willing to participate, aged between 18 and 23 years, male or female, had access to the internet, and could read and understand the Arabic language. However, students who had any serious illness and who didn't fill in the questionnaire completely were excluded from the study.

The required sample size was calculated using G*Power software (Version 3.1.9.7; Faul et al., 2007). Based on two-tailed logistic regression analysis test, a medium effect size (2.5), a significance level of (0.05), and a statistical power level of (0.8), a minimum of 192 participants was assumed to be necessary (Faul et al., 2009). However, a 20% over-sampling approach was used to account for incomplete responses, bringing the total required sample size to 230 participants.

Ethical Considerations

The ethical approval to conduct this study was obtained from Al-Balqa Applied University, under the number (120/1/2024/2025). Online informed consent

was obtained from study participants using Google Forms. All the study participants were informed that their participation was completely voluntary, and there were no incentives for participation in this study. Complete details were provided to study participants regarding the purpose and goals of the study, the time needed to fill the questionnaire completely, and the potential advantages and disadvantages of their participation. The confidentiality and anonymity of the participants were maintained for the whole study, including the gathering and analysis of data. Participants were also given the assurance that they might refuse or leave the research at any time without having to give a reason or worry about the consequences. The researchers added their e-mail addresses to the informed consent form, so that any questions or inquiries from the participants could be answered, and the study results could be provided to them upon request.

Measures

A two-part questionnaire was employed in this study. The first part consists of socio-demographic variables, including age, gender, marital status, academic program, academic year, cumulative average, religion, residency status, family monthly salary, smoking status, and blood group. The second part consists of a KAP questionnaire, which was adopted from Alsarafandi et al. (2023).

The KAP questionnaire was developed based on a literature review of previous similar studies, and it was published online (Alsarafandi et al., 2023). This questionnaire consisted of 35 items separated into three sections. The first section, consisting of 20 questions, assessed participants' knowledge across three domains: eight questions assessed general knowledge about blood donation, seven questions assessed knowledge regarding criteria for blood donors, and five questions assessed knowledge of transmissible transfusion diseases. The second section, consisting of seven questions, assessed participants' attitudes, and the third session, consisting of eight questions, assessed participants' practice regarding VBD (Alsarafandi et al., 2023).

Students were deemed to have adequate knowledge regarding VBD if they answered 10 or more of the 20 questions correctly, while scores less than 10 were considered as inadequate knowledge. Regarding attitude, a score of 6 or 7 indicated a good attitude. In terms of practice, the practice questions were displayed

as percentages rather than being combined into a score (Alsarafandi et al., 2023).

The questionnaire was developed and presented in the English language. Public health experts evaluated the face, content and convergent validities of the questionnaire. Then, it was piloted with 20 medical students to evaluate its accessibility and consistency. The authors reported that few corrections were made after pilot testing. However, the data from pilot testing was discarded by the primary questionnaire authors (Alsarafandi et al., 2023).

Translation Process into Arabic Language

The KAP questionnaire that was developed by Alsarafandi et al. (2023) in the English language was exposed to a thorough translation process into the Arabic language to guarantee its validity and semantic equivalence in Arabic. In accordance with Brislin's (1970) approach, both forward and back-translation techniques were utilized (Brislin, 1970). Initially, two qualified translators translated the 35-item English KAP questionnaire, which covered three different domains, into Arabic. Back-translation was then carried out by two more qualified translators. The final Arabic version of the questionnaire was meticulously reviewed and approved to make sure that it adhered to the original structure and content. The Arabic version of the KAP questionnaire revealed no issues with language or semantics. Finally, the reliability of the translated questionnaire was confirmed by conducting a pilot test with 20 students (who were not included in the analysis of the study) using internal consistency Cronbach's alpha ($C.\alpha$). The total $C.\alpha$ for the Arabic version of the KAP questionnaire was found to be above 0.78.

Data Collection

The data collection period was extended from December 1, 2024, until January 1, 2025. The researchers distributed the study questionnaire *via* a Google Form link to participants who fulfill the inclusion criteria, utilizing the Microsoft Teams class platform, which was then exported as an Excel file. The participants were informed that the time required to fill the questionnaire completely ranges from 5 minutes to 10 minutes. The link recorded data in an anonymous manner, ensuring that no contact information or

personal details were recorded. The data collected from the surveys was coded, and only the researchers were authorized to view it, in order to protect participants' confidentiality. Lastly, all the collected data was safely kept in a computer that needed a password to be accessed.

Data Analysis

The Statistical Package for Social Sciences (Version 27; IBM Corp., 2020) for Windows was utilized to analyze the data. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to describe the participants' demographic characteristics, and the level of KAP based on the level of measurement. Inferential statistics including Pearson correlation was used to assess the relationship between continuous study variables and knowledge and attitude regarding VBD. Also, independent sample *t*-test, and one-way analysis of variance (ANOVA) were used to assess the difference between groups and knowledge and attitude regarding VBD. Additionally, chi-square (χ^2) was used to assess the relationship between categorical independent variables and practice donation history (yes). Furthermore, phi (ϕ) and Cramér's V (ϕ_c) were used to assess the strength of the relationship between categorical independent variables and practice donation history (yes). Moreover, binary logistic regression was used to identify factors predicting practice regarding VBD. The data was presented employing an adjusted odd ratio (AOR) accompanied by its 95% confidence interval (CI). The Hosmer-Lemeshow goodness-of-fit test indicates that the model fits the data well, since $p > 0.05$. A $p < 0.05$ was supposed to indicate a statistically significant association.

Results

Participants' Demographic Characteristics

The questionnaire was delivered to 278 students. The total number of participants in this study was 246 students, with a response rate of 88.48%. The mean age of participating students was ($M = 20.65$, $SD = 1.42$; Table 1). The majority of students were females ($n=192$, 78%), and single ($n= 232$, 94.3%). More than a half of study participants were studying nursing ($n=164$, 66.7%), in the second year ($n=144$, 58.5%). The mean cumulative average was ($M = 73.72$, $SD = 8.11$).

Table 1. Participants' demographic characteristics (N = 246)

Variable	N (%)	M	SD
Age		20.65	1.42
Gender			
- Male	54 (22)		
- Female	192 (78)		
Marital status			
- Single	232 (94.3)		
- Married	14 (5.7)		
Academic program			
- Nursing	164 (66.7)		
- Midwifery	50 (20.3)		
- Pharmacy	23 (9.3)		
- Physical therapy	9 (3.7)		
Academic year			
- First year	61 (24.8)		
- Second year	144 (58.5)		
- Third year	41 (16.7)		
Cumulative Average		73.72	8.11
Religion			
- Muslim	246 (100)		
- Christian	0 (0)		
- Other	0 (0)		
Residency			
- City	95 (38.6)		
- Village	151 (61.4)		
Residency status			
- With family	241 (98)		
- Alone	5 (2)		
Family monthly income		510.8	309
Smoking status			
- Yes	38 (15.4)		
- No	208 (84.6)		
Blood group			
- A +	106 (43.1)		
- A –	8 (3.3)		
- B +	25 (10.2)		
- B –	3 (1.2)		
- AB +	10 (4.1)		
- AB –	1 (0.4)		
- O +	70 (28.5)		
- O –	23 (9.3)		

Note: N: Sample size; M: Mean; SD: Standard deviation.

All the participating students were Muslims (n= 246, 100%). The highest percentage of participants lived in villages (n= 151, 61.4%), with their families (n= 241, 98%). Also, the mean family monthly income was ($M = 510.8$, $SD = 309$). Most of participating students were not smoking (n= 208, 84.6%). Furthermore, more than one third of study participants had (A+) blood group (n= 106, 43.1%). On the other hand, only one participant (0.4%) had (AB–) blood group.

Knowledge Regarding Voluntary Blood Donation

Overall, 146 students (59.52%) exhibited good knowledge regarding VBD (Table 2). All the participating students know their blood group (n=246, 100%). More than two thirds of study participants reported that screening of blood is necessary before donation (n= 238, 96.7%) and know the blood donation day (n= 195, 79.3%). On the other hand, less than one third of study participants recognize the duration of a donation process (n= 68, 27.6%).

Table 2. Knowledge regarding voluntary blood donation (N = 246)

Domain	VBD Knowledge Items	Item Correct Answer	N For Correct Answer	%
General knowledge about blood donation	Do you know your blood group?	Yes	246	100
	How frequently can a person donate blood?	8 weeks	122	49.6
	What is the volume of blood collected during each blood donation?	< 500 ml	102	41.5
	What is the duration of a donation process?	20–60 minutes	68	27.6
	Is screening of blood necessary before donation?	Yes	238	96.7
	When is the blood donation day?	14 th June	195	79.3
	Which blood group is considered the universal donor?	O -	151	61.4
	Which blood group is considered the universal recipient?	AB +	137	55.7
Knowledge regarding criteria for a blood donor	What is the minimum age to start blood donation?	16 years	50	20.3
	What is the minimum weight for blood donation?	55 kg	140	56.9
	What is the minimum hemoglobin level required to donate blood?	Men (13)	113	45.9
		Women (12.5)	183	74.4
	What is the required blood pressure at the time of blood donation?	Highest (< 180\100)	204	82.9
		Lowest (> 90\50)	58	23.6
	What is the minimum duration between delivery of a baby and blood donation?	6 weeks	92	37.4
	Is fever a contraindication to blood donation?	Yes	203	82.5
Transfusion transmissible diseases	Are contraceptive pills a contraindication to blood donation?	No	115	46.7
	Can HIV be transmitted <i>via</i> blood donation?	Yes	194	78.9
	Can hepatitis B be transmitted <i>via</i> blood donation?	Yes	215	87.4
	Can syphilis be transmitted <i>via</i> blood donation?	Yes	174	70.7
	Can giardia be transmitted <i>via</i> blood donation?	No	117	47.6
	What are your sources of information about blood donation?	School-College	159	64.6
		Mass Media	71	28.9
Friends/Parents		16	6.5	
Overall Mean			146	59.52

Note: N: Sample size.

The majority of study participants identified the highest required blood pressure at the time of blood donation (n= 204, 82.9%) and recognized that fever is a contraindication to blood donation (n= 203, 82.5%). However, less than a quarter of participants acknowledged the minimum required age to start blood donation (n= 50, 20.3%) and identified the lowest required blood pressure at the time of blood donation (n= 58, 23.6%).

Most of study participants recognized hepatitis B (n= 215, 87.4%), human immune-deficiency virus (n= 194, 78.9%), and syphilis (n= 174, 70.7%) as transfusion transmissible diseases. In contrast, less than

a half of study participants identified that Giardia cannot be transmitted via blood donation (n= 117, 47.6%).

Attitude Regarding Voluntary Blood Donation

The majority of participating students demonstrated a good attitude regarding VBD (n= 230, 93.61%; Table 3). The highest percentage of students reported that blood donation is a good and noble act (n= 242, 98.4%). Also, 226 participants (91.9%) agreed on blood donation act. Additionally, 235 participants (95.5%) thought that the best source of blood is voluntary donation.

More than two thirds of study participants were willing to donate the blood to a relative (n= 238, 96.7%),

while 228 participants (92.7%) were willing to donate blood to anyone. Furthermore, most of study participants stated that they were willing to donate blood without knowing the religion of the recipient ($n=214$, 87%), and did not expect any reward for blood donation ($n=229$, 93.1%).

Practice Regarding Voluntary Blood Donation

Of 246 participating students, 66 (26.8%) had donated blood before, with 48 (19.5%) donated blood

one time, and 18 (7.3%) donated it twice or more times (Table 3). About a half of study participants who donated blood did that voluntarily ($n=32$, 48.5%). The highest percentage of study participants who donated blood were satisfied after blood donation ($n=63$, 95.5%), and most study participants were willing to donate blood in the future ($n=235$, 95.9%). However, the main reason for not donating blood was the lack of opportunities to donate blood ($n=110$, 44.7%).

Table 3. Attitude and practice regarding voluntary blood donation (N = 246)

Attitude Regarding Voluntary Blood Donation		N	%
VBD Attitude Items	Item Favorable Attitude		
Is blood donation a good and noble act?	Yes	242	98.4
What is your attitude towards blood donation?	Agree	226	91.9
What do you think is the best source of blood donors?	Voluntary	235	95.5
Are you willing to donate blood to your relatives?	Yes	238	96.7
Are you willing to donate blood to anyone?	Yes	228	92.7
Will you donate blood without knowing the religion of the recipient?	Yes	214	87.0
Do you expect any reward for blood donation?	No	229	93.1
Overall Attitude Mean		230	93.61
Practice Regarding Voluntary Blood Donation		N	%
VBD Practice Items	Practice		
Have you donated blood before?	Yes	66	26.8
How many times have you donated blood?*	None	180	73.2
	Once	48	19.5
	Twice or more times	18	7.3
Why did you donate blood?*	Voluntarily	32	48.5
	Relative needed blood	25	37.9
	Non-relative needed blood	9	13.6
Are you satisfied after donating blood?*	Yes	63	95.5
Are you willing to donate blood in the future?	Yes	235	95.9
Have you received blood?	Yes	24	9.8
What are the reasons for not donating so far?	Nonspecific reason	81	32.9
	Fear	34	13.8
	Parenteral pressure	3	1.2
	No awareness	18	7.3
	No opportunity	110	44.7

Note: N: Sample size; *: for donors only.

Factors Influencing Knowledge, Attitude, and Practice Regarding Voluntary Blood Donation

There is a statistically significant weak positive relationship between age and knowledge regarding VBD ($r = 0.186$, $p = 0.003$; Table 4). However, there is no statistically significant relationship between cumulative average, family monthly income and knowledge regarding VBD. Also, there is no statistically significant relationship between age, cumulative average, family monthly income and attitude regarding VBD.

There is a statistically significant difference between

gender and knowledge regarding VBD ($t=-3.44$, $p=0.001$; Table 5). Females got higher mean scores compared to males ($M=13.64$, $SD=2.75$ and $M = 12.14$, $SD = 3.04$, respectively). Also, there are statistically significant differences between smoking and knowledge regarding VBD ($t = -2.53$, $p = 0.012$). Participants who didn't smoke got higher mean scores compared to smokers ($M=13.51$, $SD = 2.91$ and $M = 12.23$, $SD = 2.47$, respectively). Additionally, there are statistically significant differences between academic program and knowledge regarding VBD ($F=4.75$, $p=0.003$). *Post-hoc* comparison using Bonferroni test indicated statistically

significant differences between nursing students and physical therapy students ($p = 0.044$; Table 6). Nursing students got higher mean scores compared to physical therapy students ($M = 13.17$, $SD = 2.92$ and $M = 10.55$, $SD = 2.18$, respectively). Also, there are statistically

significant differences between midwifery students and physical therapy students ($p = 0.002$). Midwifery students got higher mean scores compared to physical therapy students ($M = 14.22$, $SD = 2.57$ and $M = 10.55$, $SD = 2.18$, respectively).

Table 4. Relationship between demographic characteristics and knowledge and attitude regarding voluntary blood donation (N= 246)

		Age	Cumulative average	Family monthly income
Knowledge Regarding	<i>r</i>	0.186	0.090	-0.017
Voluntary Blood Donation	<i>p</i>	0.003	0.161	0.788
Attitude Regarding	<i>r</i>	-0.059	-0.058	0.024
Voluntary Blood Donation	<i>p</i>	0.354	0.368	0.711

Note: $p < 0.05$, (two-tailed).

Table 5. Relationship and differences between demographic characteristics and knowledge, attitude, and practice regarding voluntary blood donation (N= 246)

Variable	N (%)	Knowledge score Mean (SD)	Test statistic	<i>p</i> -value	Attitude score Mean (SD)	Test statistic	<i>p</i> -value	Practice Donation History (Yes) N (%)	Test statistic	<i>p</i> -value	Test statistic for Practice of Donation History (Yes)	<i>p</i> -value
Gender												
- Male	54 (22)	12.14 (3.04)	$t = -3.44$	0.001	6.25 (1.34)	$t = -1.96$	0.053	33 (13.4)	$\chi^2 = 41.42$	0.000	$\phi_c = 0.410$	0.000
- Female	192 (78)	13.64 (2.75)			6.63 (0.73)			33 (13.4)				
Marital status												
- Single	232 (94.3)	13.31 (2.91)	$t = 0.042$	0.967	6.53 (0.93)	$t = -0.976$	0.330	59 (24)	$\chi^2 = 0.725$	0.394	$\phi_c = .054$	0.394
- Married	14 (5.7)	13.28 (2.43)			6.78 (0.42)			5 (2)				
Academic program												
- Nursing	164 (66.7)	13.17 (2.92)	$F = 4.75$	0.003	6.51 (0.98)	$F = 0.371$	0.774	45 (18.3)	$\chi^2 = 2.325$	0.508	$\phi_c = 0.097$	0.508
- Midwifery	50 (20.3)	14.22 (2.57)			6.66 (0.74)			9 (3.7)				
- Pharmacy	23 (9.3)	13.47 (2.77)			6.60 (0.78)			7 (2.8)				
- Physical therapy	9 (3.7)	10.55 (2.18)			6.44 (1.01)			3 (1.2)				
Academic year												
- First year	61 (24.8)	13.24 (2.91)	$F = 0.635$	0.531	6.62 (0.85)	$F = 0.289$	0.749	17 (6.9)	$\chi^2 = 2.045$	0.360	$\phi_c = 0.091$	0.360
- Second year	144 (58.5)	13.21 (2.97)			6.54 (0.91)			40 (16.3)				
- Third year	41 (16.7)	13.78 (2.51)			6.64 (1.02)			7 (2.8)				
Residency												
- City	95 (38.6)	12.94 (2.88)	$t = -1.59$	0.111	6.63 (0.86)	$t = 1.06$	0.287	29 (11.8)	$\chi^2 = 1.636$	0.201	$\phi_c = -0.082$	0.201
- Village	151 (61.4)	13.54 (2.87)			6.50 (0.95)			35 (14.2)				
Residency status												
- With family	241 (98)	13.36 (2.88)	$t = 1.64$	0.097	6.54 (0.92)	$t = -0.607$	0.544	62 (25.2)	$\chi^2 = 0.915$	0.471	$\phi_c = 0.046$	0.471
- Alone	5 (2)	11.20 (2.16)			6.80 (0.44)			2 (0.8)				
Smoking status												
- Yes	38 (15.4)	12.23 (2.47)	$t = -2.53$	0.012	6.52 (0.97)	$t = -0.193$	0.847	26 (10.6)	$\chi^2 = 41.98$	0.000	$\phi_c = -0.413$	0.000
- No	208 (84.6)	13.51 (2.91)			6.55 (0.90)			38 (15.4)				

Note: N: Sample size; $p < 0.05$, (two-tailed).

Table 6. Post-hoc comparison using Bonferroni correction between knowledge and academic program

Academic program (First group)	Academic program (Second group)	Mean Difference (First - Second)	p-value	95% Confidence Interval	
				Lower Bound	Upper Bound
Nursing	Midwifery	-1.04927	0.133	-2.2615	0.1630
	Pharmacy	-0.30753	1.000	-1.9784	1.3633
	Physical Therapy	2.61518	0.044	0.0461	5.1842
Midwifery	Nursing	1.04927	0.133	-0.1630	2.2615
	Pharmacy	0.74174	1.000	-1.1489	2.6324
	Physical Therapy	3.66444	0.002	0.9473	6.3816
Pharmacy	Nursing	0.30753	1.000	-1.3633	1.9784
	Midwifery	-0.74174	1.000	-2.6324	1.1489
	Physical Therapy	2.92271	0.054	-0.0277	5.8731
Physical Therapy	Nursing	-2.61518	0.044	-5.1842	-0.0461
	Midwifery	-3.66444	0.002	-6.3816	-0.9473
	Pharmacy	-2.92271	0.054	-5.8731	0.0277

Note: $p < 0.05$, (two-tailed).

There is a statistically significant relationship between age and practice regarding VBD (AOR= 1.424, CI= 1.125 - 1.803, $p = 0.003$). Each additional year of age raises the likelihood of blood donation by 42.4% (Table 7). Also, there is a statistically significant moderate negative relationship between gender and practice regarding VBD ($\chi^2 = 41.42$, $\phi = 0.410$, $p < 0.001$). Males are significantly less likely to donate

blood compared to females (AOR = 0.210, CI= 0.095 - 0.463, $p < 0.001$). Additionally, there is a statistically significant moderate negative relationship between smoking and practice regarding VBD ($\chi^2 = 41.98$, $\phi = -0.413$, $p < 0.001$). Compared to smokers, non-smokers are significantly more likely to donate blood (AOR= 4.085, CI= 1.672 - 9.983, $p = 0.002$).

Table 7. Relationship between demographic characteristics and practice regarding voluntary blood donation (N= 246)

Variable	B	p-value	AOR	AOR 95% CI	
				Lower	Upper
Gender	-1.561	0.000	0.210	0.095	0.463
- Female = 0					
- Male = 1					
Smoking status	1.407	0.002	4.085	1.672	9.983
- Yes = 0					
- No = 1					
Age	0.354	0.003	1.424	1.125	1.803
GPA	-0.012	0.571	0.988	0.949	1.029
Family Monthly Salary	0.000	0.720	1.000	0.999	1.001

Note: B: Unstandardized regression coefficient; AOR: adjusted odds ratio; CI: confidence interval; $p < 0.05$, (two-tailed).

Model summary: $R^2 = 0.313$; Hosmer and Lemeshow test: $\chi^2 = 4.006$, df = 8, $p = 0.857$.

Discussion

The availability of safe blood-derived products for transfusion is vital for the preservation of life and the enhancement of patient health (Salem et al., 2024). Blood shortages due to increasing demand and insufficient supply represent currently a significant global public challenge. This challenge is most noticeable in developing countries, where healthcare systems frequently have a lack of funding, resources and equipment needed to support regular blood donation campaigns (Mpimbaza, 2020). This issue highlights the

critical importance of incorporating the provision of safe and sufficient blood supplies into healthcare policy frameworks, with particular emphasis on developing countries (Salem et al., 2024).

Understanding the KAP surrounding VBD is crucial to addressing the blood supply shortage. However, by detecting knowledge gaps and addressing misunderstandings, health authorities may launch educational initiatives that highlight the value of blood donation and encourage a donating culture in local communities (Mussema et al., 2023). KAP surveys

regarding VBD offer a contextual evidence foundation for creating interventions and communication plans that promote VBD (Alreshidi & Sula, 2022). This study aims to assess the knowledge, attitude, and practice regarding voluntary blood donation among allied health students and determine the most influential factors.

The current study results revealed that more than a half of study participants (59.52%) had good knowledge regarding VBD. This results could be related to the fact that the participants in this study were allied students who received education regarding blood donation at the university as part of their curriculum, in addition to their exposure to clinical training in hospitals, where they are more likely to engage in a process of knowledge-seeking regarding VBD. Additionally, the presence of VBD workshops and seminars in the universities could increase the level of knowledge and understanding of VBD. Furthermore, accessibility to the internet and the availability of social media for information are influential factors.

This result is higher than the result from previous studies conducted in Gaza (54.7%; Alsarafandi et al., 2023), Egypt (37.7%; Ezeldain et al., 2020), Taif, Saudi Arabia (33%; Rizwan et al., 2022), Spain and Portugal (30%; Martínez-Santos et al., 2021), Erbil (7%; Ahmed et al., 2023), and Nepal (4.5%; Kayastha et al., 2022). In contrast, it is lower than the result from previous studies conducted in Malaysia (97.1%; Fauzi et al., 2022), Ethiopia (77.6%; Mussema et al., 2024), Serbia (65%; Kocic et al., 2024), Addis Ababa, Ethiopia (69.3%; Yosef et al., 2021), Najran, Saudi Arabia (61.1%; Aedh, 2021), and Southern Ethiopia (59.8%; Shamebo et al., 2020). These discrepancies can be a result of variances in educational programs, socio-economic differences, cultural perspectives on blood donation, differences in measurement tools, and availability of information on the significance of blood donation.

The present study results showed that all study participants know their blood group. This result is higher than the result from previous studies conducted in Addis Ababa, Ethiopia (96.7%; Yosef et al., 2021), India (96.6%; Ghosh et al., 2024), Brazil (79.1%; Miriane et al., 2020), and Nepal (68.1%; Kayastha et al., 2022). Also, more than two-thirds of study participants know blood donation rates (79.3%). This result is higher than the result from previous studies in India (68.6%; Khadilkar et al., 2022), Ajman, United Arab Emirates (60.8%; Babker et al., 2024), Kashmir, India (59.4%;

Javaeed et al., 2020), Jeddah, Saudi Arabia (56.8%; Ahmad et al., 2021), and Saudi Arabia (43.6%; Alsalmi et al., 2019). On the other hand, it is lower than the result of a previous study conducted in South India (94.7%; James & Sunny, 2020).

The current study results showed that the majority of study participants identified the highest required blood pressure at the time of blood donation (82.9%), which is higher than the result from a previous study conducted in Gaza (61.1%; Alsarafandi et al., 2023). Additionally, most study participants recognize that fever is a contraindication to blood donation (82.5%), which is higher than the result from previous studies conducted in Gaza (54.4%; Alsarafandi et al., 2023), and Kashmir (25.5%; Javaeed et al., 2020).

The current study results revealed that less than one-third of study participants recognize the duration of a donation process (27.6%). This result is higher than the results from previous studies conducted in Egypt (23%; Ezeldain et al., 2020), and Saudi Arabia (21.9%; Alsalmi et al., 2019). Conversely, it is lower than the previous study result in Gaza (48%; Alsarafandi et al., 2023). Also, less than a quarter of participants acknowledged the minimum required age to start blood donation (20.3%), which is lower than the result from previous studies conducted in India (96.9%; Khadilkar et al., 2022), Malaysia (73.7%; Fauzi et al., 2022), India (65%; Ghosh et al., 2024), and Gaza (30.7%; Alsarafandi et al., 2023). Therefore, educational programs and awareness campaigns focusing on donation criteria and process are required to enhance student knowledge regarding VBD. However, accurate understanding of the blood donation criteria and process is crucial, since misunderstandings might be a barrier determinant of VBD.

The current study results revealed that more than two-thirds of participants reported that screening of blood is necessary before donation (96.7%). This result is higher than the result from previous studies conducted in South India (94.1%; James & Sunny, 2020), Egypt (88.2%; Ezeldain et al., 2020), and Gaza (84.8%; Alsarafandi et al., 2023). Additionally, most of study participants recognized hepatitis B (87.4%), human immunodeficiency virus (78.9%), and syphilis (70.7%) as transfusion-transmissible diseases. These numbers highlight another crucial issue that needs further educational improvement, particularly since our participants will be future healthcare providers. This result is higher than the results from previous research

conducted in Gaza (78.7%, 77.2%, 44.1%, respectively) (Alsarafandi et al., 2023). On the other hand, it is lower than the results from previous studies conducted in India (100%; Ghosh et al., 2024), and South India (96.7%; James & Sunny, 2020).

The current study results revealed that the majority of students demonstrated a good attitude regarding VBD (93.61%). This result could be related to that the study participants had a good knowledge regarding VBD. Additionally, allied health students learn patient care in theoretical and practical materials, and realize the importance of blood donation to save patients' lives. This will make them have a good attitude towards voluntary blood donation. This result is higher than the results from previous studies conducted in Egypt (90.3%; Ezeldain et al., 2020), Ethiopia (79.6%; Mussema et al., 2024), Nepal (78.2%; Kayastha et al., 2022), Gaza (73.2%; Alsarafandi et al., 2023), Najran, Saudi Arabia (59.6%; Aedh, 2021), Erbil (59.5%; Ahmed et al., 2023), Addis Ababa, Ethiopia (58.1%; Yosef et al., 2021), and Jeddah, Saudi Arabia (47.9%; Ahmad et al., 2021).

The current study results showed that the highest percentage of students reported that blood donation is a good and noble act (98.4%). This might be related to that all study participants were Muslims. The primary determinant for blood donation is altruism, defined as "the desire to assist those in need and preserve lives." This concept is associated with religion, as Jordan is a predominantly Muslim country, and many Islamic scholars claim that blood donation is a noble and moral act for which Muslims receive blessings (Alreshidi & Sula, 2022). This result is higher than the results from previous studies conducted in Gaza (96.7%; Alsarafandi et al., 2023), India (91.6%; Ghosh et al., 2024), Ethiopia (84.7%; Mussema et al., 2024), Southern Ethiopia (83.4%; Shamebo et al., 2020), and Kashmir-India (71.7%; Javaeed et al., 2020). Conversely, this result is lower than the results from previous studies conducted in Malaysia (100%; Fauzi et al., 2022), Saudi Arabia (99.2%; Alsalmi et al., 2019), India (99%; Khadilkar et al., 2022), and South India (98.7%; James & Sunny, 2020).

The present study revealed that most of study participants (95.5%) think that the best source of blood is voluntary donation. This result is higher than the results from previous studies conducted in Gaza (90%; Alsarafandi et al., 2023), Ethiopia (88.3%; Mussema et

al., 2024), Syria (79.9%; Salem et al., 2024), and Southern Ethiopia (66.2%; Shamebo et al., 2020). On the other hand, it is lower than the results from research conducted in Egypt (97.6%; Ezeldain et al., 2020). Additionally, more than two thirds of study participants (96.7%) were willing to donate blood to a relative, which is higher than the results from previous studies conducted in Gaza (89.1%; Alsarafandi et al., 2023), and India (70%; Ghosh et al., 2024). In contrast, it is lower than the result from a study conducted in Saudi Arabia (98%; Alsalmi et al., 2019).

The present study showed that the majority of students (92.7%) were willing to donate blood to anyone. This result is higher than the results from previous studies conducted in Saudi Arabia (90%; Alsalmi et al., 2019), Gaza (82.4%; Alsarafandi et al., 2023), Bangladesh (80.7%; Hossain et al., 2022). In contrast, this result is lower than the result from a previous study conducted in Malaysia (97.4%; Fauzi et al., 2022). In addition, most of study participants stated that they were willing to donate blood without knowing the religion of the recipient (87%), which is higher than the results from previous studies conducted in Saudi Arabia (73.9%; Alsalmi et al., 2019) and Gaza (72.3%; Alsarafandi et al., 2023).

The current study results revealed that less than one-third of study participants (26.8%) had donated blood before. This result could be related to inadequate blood donation advertising strategies, ambiguous information about the health effects of blood donation, and a lack of awareness regarding blood donation locations. Also, it could be related to lack of coordinated blood donation campaigns on the university campuses. Additionally, it could be related to lack of cooperation between universities and health institutions to organize blood donation campaigns. This result is higher than the results from previous studies conducted in Jeddah, Saudi Arabia (29.5%; Ahmad et al., 2021), Nepal (23.6%; Kayastha et al., 2022), Najran, Saudi Arabia (22%; Aedh, 2021), Ethiopia (19.3%; Mussema et al., 2024), Gaza (16.7%; Alsarafandi et al., 2023), Egypt (15.6%; Ezeldain et al., 2020), Southern Ethiopia (14.7%; Shamebo et al., 2020), and Bangladesh (8%; Hossain et al., 2022). Conversely, this result is lower than the results from previous studies conducted in Syria (43%; Salem et al., 2024), Saudi Arabia (30.1%; Alsalmi et al., 2019), and Taif, Saudi Arabia (28.3%; Rizwan et al., 2022).

The present study showed that less than one-third of

study participants (19.5%) donated blood one time. This result is higher than the results from previous studies conducted in Ethiopia (14.8%; Mussema et al., 2024), Gaza (13.1%; Alsarafandi et al., 2023), Saudi Arabia (12.7%; Alsalmi et al., 2019), Jeddah, Saudi Arabia (11.7%; Ahmad et al., 2021), and Najran, Saudi Arabia (10%; Aedh, 2021). In contrast, this result is lower than the results from previous studies conducted in South India (61.6%; James & Sunny, 2020), and Syria (26.7%; Salem et al., 2024).

The current study results showed that more than one third of donors donated blood voluntarily (48.5%). This result is lower than the results from previous studies conducted in Gaza (75.9%; Alsarafandi et al., 2023), Malaysia (59.6%; Fauzi et al., 2022), and Jeddah, Saudi Arabia (22.5%; Ahmad et al., 2021). The highest percentage of participants were satisfied after blood donation (95.5%), which is higher than the results from previous studies conducted in Gaza (77.2%; Alsarafandi et al., 2023), and Malaysia (45%; Fauzi et al., 2022). In addition, most of study participants are willing to donate blood in the future (95.9%). This result is higher than the results from previous studies conducted in Malaysia (92.1%; Fauzi et al., 2022), India (90.8%; Ghosh et al., 2024), Gaza (87.5%; Alsarafandi et al., 2023), Nepal (84.5%; Kayastha et al., 2022), Taif, Saudi Arabia (82.1%, Rizwan et al., 2022), Ajman, United Arab Emirates (78.7%; Babker et al., 2024), and Ethiopia (34.1%; Mussema et al., 2024).

The current study results revealed that the main reason for not donating blood was the lack of opportunities to donate blood (44.7%). This result is similar to those of previous studies which found lack of opportunity as a main reason for not donating blood (Alsarafandi et al., 2023; Devi et al., 2024; James & Sunny, 2020; Khadilkar et al., 2022). On the other hand, previous studies found that limited knowledge regarding blood donation, fear of donations, fear of infection, fear of needle pain, time constraints, consequences of blood donation as the main reasons for not donating blood (Ahmed et al., 2023; Babker et al., 2024; Hossain et al., 2022; Kocic et al., 2024; Mussema et al., 2023). Therefore, further efforts are necessary to recruit additional voluntary blood donors and to establish the required infrastructure to facilitate the transition of occasional donors into regular voluntary blood donors. Also, educational interventions intended to address misconceptions and fear could be successful in

promoting frequent blood donation.

The current study results revealed significant weak positive relationship between age and knowledge regarding VBD. Also, there is a significant relationship between age and practice regarding VBD. Each additional year of age raises the likelihood of blood donation by 42.4%. This result could be explained by the fact that individuals' general awareness, knowledge, and attitudes are rising with age. Thus, this will enhance the practice of VBD. However, knowledge and attitude are the primary factors affecting VBD practice (Yosef et al., 2021). This result is consistent with those of previous studies, which found a positive relationship between age and knowledge regarding VBD (El-Bilbeisi et al., 2023; Eltewacy et al., 2024; Ezeldain et al., 2020). In addition, previous studies found a significant association between age and practice regarding VBD (Eltewacy et al., 2024; Yosef et al., 2021). In contrast, this result is inconsistent with a previous-study result, which didn't found an association between age and knowledge regarding VBD (Kayastha et al., 2022). Also, some other studies didn't find a significant relationship between age and practice regarding VBD (Mussema et al., 2023, 2024).

The current study results revealed significant differences between gender and knowledge regarding VBD. However, females got higher mean scores compared to males. This result could be related to the fact that female students are often more concerned about health issues due to regular follow-ups with doctors for issues, such as menstruation, anemia, and nutrition. Thus, this makes them more aware of blood donation. Additionally, some blood donation campaigns may target females more, because blood donation is associated with conditions such as childbirth and anemia. This result is consistent with a previous study, which found that females had a higher level of knowledge regarding VBD compared to males (Omaish et al., 2024). In contrast, this result is inconsistent with previous studies which found that knowledge regarding VBD didn't significantly differ between males and females (Babker et al., 2024; Eltewacy et al., 2024; Ezeldain et al., 2020; Kayastha et al., 2022; Khadilkar et al., 2022).

The present study showed a significant moderate negative relationship between gender and practice regarding VBD. Males are significantly less likely to donate blood compared to females. The likelihood of donating blood is (0.21%) lower for males than for females. This could be explained by higher level of

knowledge among females compared to males. This result is inconsistent with previous studies which found that males are more likely to donate blood than females (Devi et al., 2024; El-Bilbeisi et al., 2023; Eltewacy et al., 2024; Kouka, 2021; Mussema et al., 2023).

The current study results revealed significant differences between smoking and knowledge regarding VBD. Participants who didn't smoke got higher mean scores compared to smokers. Additionally, there is a moderate negative relationship between smoking and practice regarding VBD. Compared to smokers, non-smokers are significantly more likely to donate blood. The likelihood of a non-smoker donating blood is 4.08 times greater than in smokers. This result could be related to that non-smokers might be more health conscious than smokers, which makes them seek out more health-related information, including VBD. Additionally, non-smokers regularly feel more accountable for their own and others' health, which leads them to look for additional information about how VBD could improve public health. Furthermore, the absence of smoking-related constraints encourages non-smokers to voluntarily donate blood without hesitation. However, it is difficult to compare this result with those of previous studies, since there are no previous studies which assessed smoking and its effects on KAP regarding VBD among allied health students.

The current study results showed significant differences between academic program and knowledge regarding VBD. Nursing and midwifery students got higher mean scores compared to physical therapy students. This results could be related to the possibility that students from particular academic programs might be more widely exposed to blood donation campaigns or educational programs. Also, this could result from variations in the curriculum's emphasis, extracurricular activities, or collaborations with medical institutions that support blood donation. This result is consistent with previous studies which found significant differences between college and knowledge regarding VBD (Kouka, 2021; Omaish et al., 2024). On the other hand, this result is inconsistent with a previous study, which found that there are no significant differences between college of study and knowledge regarding VBD (Kayastha et al., 2022).

Limitations and Recommendations

This is the first study that assesses knowledge,

attitude, and practice (KAP) regarding voluntary blood donation among allied health students and determine the most influential factors in Jordan. However, this study has some limitations. Firstly, the sample size of 246 allied health students may not adequately represent the general population, thereby constraining the generalizability of the study's findings. Secondly, utilizing a cross-sectional design, convenience sampling, and an online self-administered questionnaire might be vulnerable to social desirability bias and selection bias, as some students could have given false and unreal information, since blood donation is seen as a socially acceptable activity, thereby affecting the truth of responses, sample representation, and generalizability of the study results. Future studies should include a greater variety of demographics, a larger sample size, and random sampling techniques to increase the generalizability of the results. Also, conducting mixed-method exploratory design research might yield deeper insights related to KAP regarding VBD. Additionally, conducting longitudinal studies would enhance the understanding of KAP regarding VBD and follow changes over time.

Implications to Nursing

The findings of the present study are important for understanding the VBD aspect among allied health students. The findings emphasize the need for a comprehensive strategy encompassing educational campaigns designed to raise knowledge and awareness regarding VBD, while also promoting active participation. These educational campaigns should offer credible information regarding the significance, necessity, and prerequisites of VBD, along with accurate data on the incidence of complications. Also, comprehensive and specific health information should be offered regarding the requirements for eligibility, risks and health benefits of blood donation, the volume of blood donated, the number of patients who benefit from a single blood donation, and the significance of blood in preserving lives and enhancing community health and well-being. Additionally, correction of misunderstandings, misconceptions, and unreasonable worries should also be addressed.

The findings of the current study highlight the need for integrating topics regarding VBD and its significance into university curricula, regardless of the academic year. This might include topics covered in the

course materials, seminars, workshops, guest lectures given by medical experts, and school visits to blood banks. Furthermore, it is important to promote collaboration between universities and regional health institutions to organize frequent blood donation drives on campus. This might help raise overall donation rates and make blood donation easier for students. However, for students who have transportation issues, more mobile or accessible donation centers could be placed in convenient locations, and donation centers' operating hours might be extended. Moreover, utilizing mobile applications and reminder messages might effectively bridge the gap between blood donors, blood banks, and patients needing blood.

Conclusion

The findings indicate that more than a half of study participants had adequate knowledge (59.5%), and good attitude (93.6%) regarding VBD, and only a small portion (26.8%) previously participated in the practice of VBD. Also, there is a significant weak positive relationship between age and knowledge regarding VBD. In addition, there are significant differences

between gender, smoking status, academic program and knowledge regarding VBD. Furthermore, there is a significant relationship between age, gender, smoking status and practice regarding VBD. Implementing focused educational campaigns and increasing accessibility to blood-donation opportunities are crucial to foster a culture of blood donation among university students.

Acknowledgements

The authors would like to express their special thanks to allied health students who participated in this study.

Conflict of Interests

No conflict of interests is to be declared by the authors.

Funding or Sources of Financial Support

The authors received no funding or financial support for the research, authorship, and/or publication of this article.

REFERENCES

- Aedh, A. (2021). Knowledge, attitudes and practices towards blood donation and associated factors among Najran University's Students, KSA. *International Journal of Medical Research & Health Sciences*, 10(10), 122-129. <https://shorturl.at/T6pTv>
- Ahmad, H., Sinky, D., Bantan, A., Yasawy, M., Almohaimeed, L., & Almohaimeed, A. (2021). Knowledge, attitude, and practice regarding blood donation among medical students in Ibn Sina National College, Saudi Arabia. *International Journal of Medicine in Developing Countries*, 5(12), 2129-2133. <https://doi.org/10.24911/ijmdc.51-1636363791>
- Ahmed, S., Tahir, A., & Senior, M. (2023). Knowledge, attitudes, and barriers of blood donation among students of Soran technical college: A cross-sectional study. *Erbil Journal of Nursing and Midwifery*, 6(1), 22-27. <https://doi.org/10.15218/ejnm.2023.03>
- Alreshidi, M.A., & Sula, I. (2022). A comparison of the knowledge, attitude, practice and motivation toward blood donation among Albanian, Saudi and Turkish Citizens. *Journal of Blood Medicine*, 13, 603-610. <https://doi.org/10.2147/JBM.S383059>
- Alsalmi, M., Almalki, H., Alghamdi, A., & Aljasir, B. (2019). Knowledge, attitude and practice of blood donation among health-profession students in Saudi Arabia; A cross-sectional study. *Journal of Family Medicine and Primary Care*, 8(7), 2322-2327. https://doi.org/10.4103/jfmpc.jfmpc_415_19
- Alsarafandi, M., Al-Karim Sammour, A., Eljila, Y., Aldabbour, B., Muhaisen, D., Shiha, H. A., Alasttal, A., Dalloul, N., & Abuhaiba, A. (2023). Knowledge, attitude, and practice among medical students in Gaza Strip towards voluntary blood donation: A cross-sectional study. *BMC Health Services Research*, 23(1). <https://doi.org/10.1186/s12913-023-10338-5>
- Babker, A., Gopinath, K.S., Manimaran, S., Alsalkhadi, I.A., Kandakurti, P.K., & Osman, A.L. (2024). Knowledge, perceptions, and practices of blood donation among undergraduate students at Gulf Medical University, United Arab Emirates: A cross-sectional study. *Italian Journal of Medicine*, 18(3), 336-340. <https://doi.org/10.4081/itjm.2024.1788>

- Beyene, G.A. (2020). Voluntary blood donation knowledge, attitudes, and practices in central Ethiopia. *International Journal of General Medicine*, 13, 67-76. <https://doi.org/10.2147/IJGM.S246138>
- Brislin, R.W. (1970). Back-translation for cross-cultural research. *Journal of Cross-cultural Psychology*, 1(3), 185-216. <https://doi.org/10.1177/135910457000100301>
- Devi, V., Thirumurugan, E., Karthick, R., Indian, E.A., Abinaya, G., Hemalatha, R., & Sunil, P. (2024). Assessment of knowledge, attitude, and practice of blood donation among paramedical students of a medical college in Chennai, Tamil Nadu. *Iraqi Journal of Hematology*, 13(1), 71-78. https://doi.org/10.4103/ijh.ijh_21_24
- El-Bilbeisi, A.H., Abuzerr, S., & El Afifi, A. (2023). Knowledge, attitudes, and practices toward blood donation in the Gaza Strip, Palestine. *SAGE Open Medicine*, 11, 1-8. <https://doi.org/10.1177/20503121231207707>
- Eltewacy, N., Ali, H.T., Owais, T.A., Alkanj, S., Ebada, M.A., Elbahnasawy, M., Ahmed, A.H.B., Ahmed, M.H., Liaquat, A., Hasanin, E., Moghari, M.B., Jabo, M.D.A., Alhumaidi, N.T., Janem, A.M., Suleiman, H. Subhi, Rais, M.A., Riyaz, R., Salem, M., Al-Mekhlafi, M.A., ..., & Hasan, M. (2024). Unveiling blood donation knowledge, attitude, and practices among 12,606 university students: A cross-sectional study across 16 countries. *Scientific Reports*, 14(1), 1-16. <https://doi.org/10.1038/s41598-024-58284-4>
- Etoom, M., Akhu-Zaheya, L., & Alnjadat, R. (2024). Psychometric properties of the arabic version of the self-assessment nursing informatics competency scale. *Jordan Journal of Nursing Research*, 3(4), 76-94. <https://doi.org/10.14525/JJNR.v3i4.08>
- Ezeldain, A., El-Sayed Hossein, Y., Sameh Mohammed, E., Mohammed Amein, N., Asmaa, Y. et al. (2020). Assessment of knowledge and attitude among Faculty of Nursing students regarding blood donation. *Minia Scientific Nursing Journal*, 8(1), 39-47. https://msnj.journals.ekb.eg/article_188037_9a03f2e2d04e49bf0f75ab266a53380f.pdf
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A.G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, 41(4), 1149-1160. <https://doi.org/10.3758/BRM.41.4.1149>
- Faul, F., Erdfelder, E., Lang, A.G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175-191. <https://doi.org/10.3758/BF03193146/METRICS>
- Fauzi, R., Jamaludin, N.S., Ahmed, N.F., & Sharoni, S. K. A. (2022). Knowledge, attitude and practice (KAP) towards blood donation among E-PJJ degree nursing students. *Malaysian Journal of Nursing*, 13(3), 47-52. <https://doi.org/10.31674/mjn.2022.v13i02.007>
- Ghosh, A., Dasgupta, D., & Kumar Sau, A. (2024). Knowledge, attitude and practice towards voluntary blood donation among medical students of a tertiary care medical institute of an eastern state of India. *International Journal of Academic Medicine and Pharmacy*, 6(6), 554-546. <https://doi.org/10.47009/jamp.2024.6.6.106>
- Golzar, J., Shagofah, N., & Tajik, O. (2022). Convenience sampling. *International Journal of Education & Language Studies*, 1(2), 72-77. <https://doi.org/10.22034/ijels.2022.162981>
- Hossain, M., Siam, M.H.B., Hasan, M.N., Jahan, R., & Siddiquee, M.H. (2022). Knowledge, attitude, and practice towards blood donation among residential students and teachers of religious institutions in Bangladesh: A cross-sectional study. *Heliyon*, 8(10), 1-7. <https://doi.org/10.1016/j.heliyon.2022.e10792>
- IBM Corp. (2020). *IBM SPSS Statistics for Windows*, Version 27.0. Armonk, NY: IBM Corp.
- James, T., & Sunny, R. (2020). Knowledge, Attitude and Practices of Voluntary Blood Donation among Medical Students in a Teaching Institution, South India. *Journal of Evidence-based Medicine and Healthcare*, 7(16), 805-809. <https://doi.org/10.18410/jebmh/2020/175>
- Javaeed, A., Kousar, R., Farooq, A., Hina, S., Ghauri, S.K., & Tabbasum, T. (2020). Knowledge, attitude, and practice of blood donation among undergraduate medical students in Azad Kashmir. *Cureus*, 12(4), 1-9. <https://doi.org/10.7759/CUREUS.7733>
- Kayastha, B., Lakhe, D., Pradhan, R., Sainju, S., & Kayastha Lecturer, B. (2022). Evaluation of knowledge, attitude and practice regarding blood donation among bachelor level students in Kathmandu. *Janaki Medical College Journal of Medical Sciences*, 10(1), 46-54. <https://doi.org/10.3126/jmcjms.v10i1.44637>
- Khadilkar, N.P., Mamatha, B.V., Bhat, B.M., & Crasta, P.S. (2022). Knowledge, attitudes and practices among medical students on blood donation. *Biomedicine*, 42(6), 1228-1232. <https://doi.org/10.51248/v42i6.2311>

- Khan, M.S., Islam, K.N., Rana, S., & Sarkar, N. K. (2024). Knowledge, attitude, and practice of blood donation: A cross-sectional survey in Khulna city, Bangladesh. *Public Health in Practice*, 7, 1-9. <https://doi.org/10.1016/j.puhip.2024.100488>
- Kocic, N., Bujandric, N., Budakov Obradovic, Z., Grujic, J., Bezanovic, M., & Kolarovic, J. (2024). Factors influencing blood donation among university students in Vojvodina, Serbia: Cross-sectional study. *BMJ Open*, 14(11), e086700. <https://doi.org/10.1136/bmjopen-2024-086700>
- Kouka, E. (2021). Assessment of knowledge, attitude, and practice among health professionals in an oncological hospital on voluntary blood donation: Investigating their participation in programs to promote blood donation. *Global Journal of Transfusion Medicine*, 6(1), 6-14. https://doi.org/10.4103/gjtm.gjtm_107_20
- Martínez-Santos, A.E., Fernández-de-la-Iglesia, J. del C., Pazos-Couselo, M., Marques, E., Veríssimo, C., & Rodríguez-González, R. (2021). Attitudes and knowledge towards blood donation among nursing students: A cross-sectional study in Spain and Portugal. *Nurse Education Today*, 106, 1-7. <https://doi.org/10.1016/j.nedt.2021.105100>
- Miriane, Z., Bueno-Silva, C.C., Ribeiro-Pizzo, L.B., & Martinez, E.Z. (2020). Knowledge, attitude and practice of blood donation and the role of religious beliefs among health sciences' undergraduate students. *Transfusion and Apheresis Science*, 59(5), 1-7. <https://doi.org/10.1016/j.transci.2020.102822>
- Mpimbaza, A. (2020). Blood transfusion in sub-Saharan Africa: Walking a tightrope. *The Lancet Haematology*, 7(11), e774-e775. [https://doi.org/10.1016/S2352-3026\(20\)30329-X](https://doi.org/10.1016/S2352-3026(20)30329-X)
- Mugion, R., Pasca, M.G., Di Pietro, L., & Renzi, M.F. (2021). Promoting the propensity for blood donation through the understanding of its determinants. *BMC Health Services Research*, 21(1), 1-20. <https://doi.org/10.1186/s12913-021-06134-8>
- Mussema, A., Bawore, S.G., Abebaw, T., Tadese, W., Belayineh, M., Yirga, A., Mohammed, T., & Seid, A.M. (2023). Voluntary blood donation knowledge, attitude, and practice among adult populations of Hosanna Town, South Ethiopia: A community-based cross-sectional study. *Frontiers in Public Health*, 11, 1-7. <https://doi.org/10.3389/fpubh.2023.1141544>
- Mussema, A., Nigussie, B., Anmaw, B., Abera, H., Nageso, H., Gebre Bawore, S., Shemsu, A., Woldeesenbet, D., Mohammed, K., Seid, A.M., & Admasu, D. (2024). Knowledge, attitude, practice and associated factors about voluntary blood donation among regular undergraduate students of Wachemo University, Southcentral Ethiopia: A cross-sectional study. *Frontiers in Public Health*, 12, 1-12. <https://doi.org/10.3389/fpubh.2024.1485864>
- Neupane, P., Prakesh, J., Amgain, K., & Nepal, R. (2022). Knowledge, attitude and practice of blood donation among health science students at Kathmandu: A cross-sectional study. *Nepal Medical Journal*, 4(2), 75-80. <https://doi.org/10.37080/nmj.215>
- Ogundeji, S., Ajayi, O.D., Busari, O.E., Ogundeji, O.A., Adepoju, O.A., & Esan, F.G. (2021). Knowledge, attitude, and perception towards voluntary blood donation among university students in Nigeria. *ISBT Science Series*, 16(1), 85-91. <https://doi.org/10.1111/VOXS.12614>
- Omaish, R.S., Al-Fayyadh, Z.A., Al-Habashneh, S.M., Al-Mashhdi, S.Y., Khasawneh, S.Y., Naber, I.A., Bourghli, S.L., Al-Adily, T.N., Al-Farajeh, F.M., & Sughayer, M.A. (2024). A survey assessing knowledge and attitude about blood donation among blood donors in Jordan. *SAGE Open Medicine*, 12, 1-8. <https://doi.org/10.1177/20503121241259340>
- Rizwan, F.A., Al-Amri, R.O., Al-Harathi, A.A., Al-Otaibi, N.A., & Al-Otaibi, R.F. (2022). Knowledge, attitude, and blood donation practices among medical students of Taif University, Saudi Arabia. *Saudi Journal for Health Sciences*, 11(1), 68-73. https://doi.org/10.4103/sjhs.sjhs_77_21
- Saeed, K., Naeemi, S., Hakim, M.S., & Arian, A.K. (2024). Factors influencing blood donation. *Journal of Hematology and Allied Sciences*, 4(2), 67-72. https://doi.org/10.25259/JHAS_49_2024
- Salem, M., Kahwaji, A., Owais, T.A., Attia, M., Abdulhadi, A., Tassabehji, O., Hawarah, A., Latifeh, Y., & Alsuliman, T. (2024). Knowledge, attitude, and practice of blood donation among undergraduate medical students in Syria. *Medicine*, 103(8), 1-5. <https://doi.org/10.1097/MD.00000000000037086>
- Shamebo, T., Gedebo, C., Damtew, M., Woldegeorgis, T., Girma, E., & Terefe, D. (2020). Assessment of knowledge, attitude and practice of voluntary blood donation among undergraduate students in Awada campus, Hawassa University, southern Ethiopia. *Journal of Blood Disorders & Transfusion*, 11(1), 1-6. <https://doi.org/10.35248/2155-9864.20.11.431>

WHO. (2010). *Towards 100% voluntary blood donation: A global framework for action*. <https://www.ncbi.nlm.nih.gov/books/NBK305666/>

WHO. (2023). *Blood safety and availability*. <https://www.who.int/news-room/fact-sheets/detail/blood-safety-and-availability>

Yosef, T., Wondimu, W., Tesfaye, M., & Tesfaw, A. (2021). Knowledge and attitude towards blood donation among college students in southwest Ethiopia. *Pan African Medical Journal*, 38, 1-10. <https://doi.org/10.11604/pamj.2021.38.249.22411>