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Assessment Of Cardiovascular Disease Risk Factors Knowledge Among Nursing Students in Four Private Nursing Colleges, A Descriptive Cross-Sectional Study from Peshawar, Pakistan

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Abstract

Background: Cardiovascular diseases and their risk factors are the major global causes of morbidity and mortality. Pakistan is among the countries experiencing a high prevalence of CVD-related deaths, especially among the youth, in recent years. Nursing students, as future frontline healthcare providers, must be knowledgeable about these risk factors to prevent the disease in others, as well as to reduce their own risk.

Objective: To evaluate nursing students' knowledge about CVD risk factors and its association with sociodemographic factors.

Methodology: A descriptive cross sectional design using convenience sampling technique was employed. The participants participated were 369 third- and fourth-year nursing students from four private nursing colleges. Data were collected through adopted structured questionnaire with Cronbach's alpha value of 0.76. For statistical analysis SPSS version 27 was used, and Mann-Whitney U and Kruskal-Wallis tests were applied for determination of association.

Result: The findings revealed that nursing students had moderate awareness of CVD and its risk factors, with a mean score of 20.10 ± 3.25. Statistically, it was found that nursing students possessed highest awareness about hypertension (94%), obesity (91.1%), stress (85.4%), and dietary factors (86.4%), and had the lowest awareness about HDL cholesterol (47.4%), red meat (47.7 %), slow walking (34.4%), and cholesterol-lowering medications (41.7%). Significant associations in knowledge were found for gender ($p < 0.001$) and marital status ($p = 0.004$), with males and single students showing higher scores.
Conclusion: A moderate level of knowledge is possessed by nursing students, but certain deficiencies in knowledge still exist, which emphasize the need for targeted educational programs and curriculum enhancement for better prevention of cardiovascular disease.

Introduction

Cardiovascular diseases (CVDs) are diseases of heart, or those that involve the blood vessels and can occur because of the interplay of socio-economic, metabolic, behavioral, and environmental risk factors. Major modifiable risk factors that are responsible for CVDs are high blood pressure, unhealthy diet, hypercholesteremia, diabetes, air pollution, obesity, tobacco use, kidney disease, physical inactivity, harmful consumption of alcohol and psychological stress, which are responsible for increasing burden of CVDs.(Cesare et al., 2023) Despite the availability of safe and preventive measures CVDs is still the leading cause of global death and premature loss of life. However, among all the 18.6 million deaths that occurred because of CVD worldwide in 2019, over 58% were identified in Asia, which illustrates a local and pressing public health issue. Out of the entire population of the United States, an estimated 127.9 million adults (48.6 percent of the total population) were affected from CVDs (Martin et al., 2024). In Europe, CVDs account for 47% of all the deaths, with overall prevalence ranging from 6% to 10% and even higher in central and Eastern Europe (Timmis et al., 2024). CVD is the largest cause of death in China and leads to nearly 4 million death per year including 0.5 to 2.4 million of which are due to modifiable factors.(Liu et al., 2021). In Iran, CVDs are responsible for 46% of all deaths and in India CVDs contribute to 24.8% of total deaths and its prevalence increases day by day due to the lack of proper awareness (Kundu et al., 2023)(Sarrafzadegan & Mohammadifard, 2019). CVDs is responsible for nearly 30 to 40% of all the deaths in Pakistan, with a death rate of 357.88 per 100,000, surpassing the global average of 239.85 per 100,000 individuals indicating a higher burden of CVD.

Risk factors responsible for CVD are classified into Unmodifiable risk factors (race, age, gender, and family history) and modifiable risk factors (hypertension, diabetes, hyperlipidemia, smoking, alcohol consumption, and obesity) (Kumsar, 2015). Additionally, high consanguinity rates (58% marrying first or second cousins) also increases the genetic risk for CVD.(Samad & Hanif, 2023).

Nursing students play a critical role in the prevention early detection, and education related to cardiovascular diseases (CVDs). As future healthcare providers their understanding and awareness of CVD risk factors are directly influenced by the quality and comprehensiveness of their academic curriculum. Therefore, the integration of cardiovascular health education within nursing curricula is essential to prepare students to effectively manage and educate patients on modifiable and non-modifiable risk factors (Papathanasiou et al., 2014). Although effective treatments are available, the level of awareness, particularly in adolescents and young adults, is low, and thus education constitutes a vital element of the long-term control of the disease. Recent research in Peshawar's three major hospitals, young adults, especially students, follow unhealthy sedentary lifestyles indicating low awareness about CVD risk factors (Shah et al., 2018). Recent studies reveal generally low to moderate knowledge on CVD risk factors among young adults, especially nursing students in developing countries like

Turkey, Ethiopia, sub-Saharan Africa, and Iran. (Abdela et al., 2019) (Boateng et al., 2017) (Estebsari et al., 2024) (KAYA et al., 2019).

But there is a lack of research on CVD risk factor knowledge among nursing students especially in Peshawar indicating a significant gap in the literature. So educational interventions together with screening programs must be implemented immediately for improved awareness and promotion of healthy behaviors. The aim of the study is to identify nursing students knowledge of CVD risk factors and its association with sociodemographic factors.

The study is significant because it can enhance cardiovascular understanding among nursing students which will benefit their personal health and enable them to model proper behaviors for their patients and community members. The need to educate the nursing students effectively about CVDs is much more important in the case of Pakistan where the prevalence of the diseases increases because of the influence of poor dietary habits lack of physical activity, smoking, and lack of awareness (Al-Shloul, 2022). Having a better understanding, they will be able to emulate healthy behaviors, identify the risk exposure early in the clinical practice and advise people and communities to make informed health choices. Also, the results of this research can guide the formation of specific pedagogical measures in nursing programs, and, thus, enhance the overall health conditions and increase the strength of the environment in the field of public health.

METHODOLOGY

A quantitative descriptive cross-sectional study design was used to conduct this study. This research was conducted from four private nursing colleges located in Peshawar, Khyber Pakhtunkhwa, Pakistan. These colleges were Farkhanda Institute of Nursing (affiliated with Gandhara University)**,** Rehman College of Nursing (affiliated with Khyber medical university)**,** North West Institute of Health Sciences (affiliated with Khyber Medical University)**,** Rufaida Nursing College, also affiliated with Khyber Medical University (KMU)**.** The study was carried out during 6–8-month period between 12 November 2024 to 12 June 2025.

The Sample Size was 369 and was calculated by using Open Epi sample size calculator and on the bases of previous study which indicates knowledge of CVD risk factors among nursing students (Abdela et al., 2019) (Özpancar et al., 2019) (Kumsar, 2015) (KAYA et al., 2019). The Margin Error taken for the study were 05% with confidence Interval of 95% and the estimated population taken were 1000000 with Population proportion OR Anticipated frequency of 40% then the calculated Sample size comes out to be 369 and its taken for collection of data

A non-probability convenient sampling technique was used to conduct the study from the undergraduate nursing students studied in these selected private nursing colleges in Peshawar Based on predefined inclusion and exclusion criteria participants were selected. Before the commencement of data collection, all students were very well informed about the purpose and procedures of the study, and voluntary consent was obtained in accordance with ethical research standards**.**

The inclusion criteria include nursing students enrolled in the 3rd and 4th year of their nursing program at these four private nursing institutions. It also includes those who give informed consent and voluntarily participate in the study. The exclusion criteria includes students enrolled in programs other than nursing (e.g., pharmacy, or allied health sciences) at this private colleges. And those Students who are unwilling or unable to complete the study questionnaire or assessment tool fully.

A structured, printed paper-based questionnaire was distributed to a number of nursing students for the data collection from them. The questionnaire had two parts. The first one is sociodemographic characteristics form which was used to collect information of the participants and was adopted from the George prince study and was modified by the researcher after reviewing many literatures (5)(6)(7). This form is composed of 20 items to measure the sociodemographic information and life styles characteristics of the

participant. The second part of questionnaire was CVD risk factors knowledge level (Carrf-Kl Scale) which were 28 items tool developed by Arikan (8). The first four items measure the general knowledge of CVD such as what is CVD, ways to prevent CVD and the effect of age on CVD. There were fifteen items that measure knowledge of risk factors for CVD (items 5, 6, 9–12, 14, 18–20, 23–25, 27 and 28). The remaining nine items assess the behavioral outcomes that indicate modification of risk factors (items 7, 8, 13, 15–17, 21, 22 and 26). Each item consists of a statement to which the participant responds as true, false or I don't know. Each correct answer receives one point whereas a wrong answer or an answer of I don't know receives a score of zero. Six of the items (items 11, 12, 16, 17, 24 and 26) are reverse scored. Thus, total score of participants can range from 0 to 28. No cut-off score has been determined to categorize participants' knowledge.

Reliability and validity

The scale used for data collection was CARRF-KL Scale and was developed by Arikan (Arikan et al., 2009) and is tested for cardiovascular disease risk factors and has acceptable internal consistency with Cronbach's alpha of 0.76. (8).

Data Analysis Procedure

Data was analyzed through Software SPSS version 27. Descriptive statistics were applied for age and cholesterol where mean and standard deviation were calculated while for gender composition and smoking habits and dietary patterns frequency and percentage were employed. Inferential Statistics using Kruskal Wallis and Mann-Whitney U test were employed to determine the relationship between demographic factors and CVD knowledge. Since the data did not meet the normality assumption as indicated by the Kolmogorov-Smirnov and Shapiro-Wilk test which has produced statistically significant answers ($p < 0.001$) showing that the distribution is not normal. Thus, non-parametric statistical procedures were preferred to use in analyzing inter-group differences in demographic factors.

Ethical consideration

Approval was obtained from Graduate Committee of FIN and Ethical Review Board of Gandhara University Peshawar. Permission was granted from the concerned departments. Study participants were recruited with proper instructions as per information sheet. Consent was obtained from each participant participating in the study.

Data confidentiality

Pseudo names were given to the participants for maintaining anonymity. Data were protected via password and was only accessible to the researchers. Data were discarded after five years.

Result

In this chapter the findings of the study carried out to assess the knowledge of nursing students related to Cardiovascular disease Risk factors in Four private Nursing Colleges in Peshawar.

Table: 1 Demographic characteristics

Descriptive Characteristics	Frequency	Percentage (%)
Age		
18-25	354	95.7
25-45	15	4.1
45-60	0	0

Nationality		
Pakistani	369	100
Dual Nationality	0	0.00
Foreigner	0	0.00
Gender		
Male	260	70.5
Female	109	29.5
Marital status		
Single	339	91.9
Married	30	8.1
Religious background		
Muslim	356	96.5
Christian	13	3.5
Year (Class)		
Year 3	187	50.7
Year 4	182	49.3
Institute		
Farkhanda Institute of Nursing and Public Health	92	24.9
Rufaida Institute of Nursing	93	25.2
Rehman College of Nursing	92	24.9
Northwest College of Nursing	92	24.9

The socio demographic profile of the nursing students that participated in the study as shown in above table indicated that all nursing students had a Pakistani nationality and none of them had foreign or dual nationality. Most of them were male as 70.5% (n= 260), and the strength of females were low about 29.5% (n= 109). The majority of nursing students were single (91.9%), and only 8.1 percent were married. Based on religious leanings, most of them were Muslims (96.5%) and some were Christians (3.5%). Participants from two academic years were included in the study in which fifty percent (50%) from third year participated in the study, and forty nine percent (49%) were from fourth year. The finding indicated nursing students from that Rufaida Institute of Nursing are higher (25.2%) in number as compared to other followed by

Farkhanda Institute of Nursing and Public Health, Rehman College of Nursing and Northwest College of Nursing with a similar percentage (24.9%) of the sample. The ages of the participants were between 18 to 25 and 25 to 45 years with a frequency of 95.7 to 4.1 respectively.

Table: 2 Sociodemographic Characteristics

Descriptive Characteristics	**Frequency**	**Percentage (%)**
Do you have a chronic disease?		
Yes	37	10.0
No	332	90.0
Do you know what is cardiovascular diseases?		
Yes	257	69.6
No	112	30.4
Do you have a family history of cardiovascular diseases?		
Yes	96	26.0
No	273	74.0
How do you evaluate your Salt Consumption?		
Without	30	8.1
Less salty	269	72.9
Salty	70	19.0
Do you think you pay attention to your nutrition?		
Yes	247	69.9
No	122	33.1
Which oil product do you prefer in your diet?		
Vegetables	235	63.7
Olive	99	26.8
Butter	35	9.5
Do you smoke?		

Yes	28	7.6
No	341	92.4
Do you drink Alcohol?		
Yes	0	0.0
No	368	99.7
Sometimes	1	0.3
Do you exercise?		
Yes	251	68.0
No	118	32.0
Family History of CVD (from first-degree relatives)		
Yes	80	21.7
No	289	78.3
How do you evaluate your health status?		
Good	226	61.2
Medium	135	36.6
Bad	8	2.2

In the above table the Analysis indicates that 90.0% of the nursing students had no chronic disease, whereas 10% had a chronic disease. A total of 69.6% of respondents knew about cardiovascular disease (CVD) while 30.4% didn't know well about it. The finding shows that 26% of the participants had a family history of CVD and the rest have no such history. Students that consume less salt in their foods were about 72.9% while those consuming foods that were salty were 19%, and 8.1 percent did not consume any salt. The finding also indicated that most of them (63.7%) favored vegetable oil in their dietary habits, followed by olive oil (26.8%) and also butter (9.5%). 92.4% participants were not smokers, and 7.6 percent were smokers. Practically, all the students (99.7%) claimed not to consume alcohol in any way, whereas a solitary respondent (0.3%) stated drinking occasionally. Majority (68.0) of the students take regular physical exercise, whereas 32.0 did not. 78.3 percent of data shows that did not have family History of CVD (from first-degree relatives), however 21.7% had. On a self-perceived health scale, in response to the question on whether their overall health is Good, Medium or Bad, 61.2, 36.6 and 2.2 respectively reported themselves as Good, Medium and Bad. On the question of awareness to nutrition, 69.9 respondents that they cared about their nutrition well whereas 33.1 respondents confessed that they do not care about their nutrition.

Table:3 Recorded score on Carrf-KL scale (n=369)

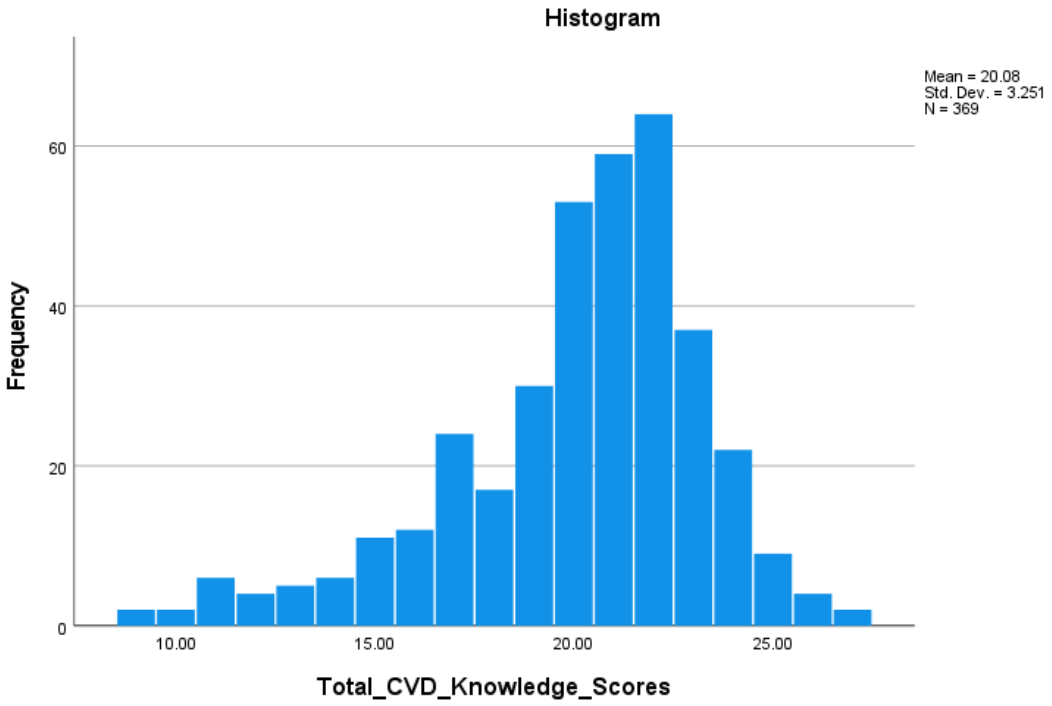
Scale Questions			Correct		Incorrect	
			n	%	n	%
1.	A person always understands that he/she has heart disease.	T	171	46.3	198	53.7
2.	Having heart disease in your family increases your risk of heart disease.	T	296	80.2	73	19.8
3.	Older people are at greater risk for heart disease.	T	332	90.0	37	10.0
4.	Coronary heart disease can be prevented.	T	300	81.3	69	18.7
5.	The most important preventable cause of death and disease in our country is smoking.	T	241	65.3	128	34.7
6.	Smoking is a risk factor for heart disease.	T	314	85.4	55	14.9
7.	If a person stops smoking, the risk of heart disease is reduced.	T	315	85.4	54	14.6
8.	Eating 2-3 pieces of fruit and 2 plates of vegetable food is useful every day.	T	319	86.4	50	13.6
9.	It is harmful to eat more than 3 red meat meals a week.	T	176	47.7	193	52.3
10.	Salty food causes high blood pressure.	T	325	88.1	44	11.9
11.	Oily foods do not increase levels of cholesterol in the blood.	F	266	72.1	103	27.9
12.	Fats that are solid at room temperature are beneficial for heart health.	F	255	69.1	114	30.9
13.	Feeding a low-fat and carbohydrate diet is beneficial for the heart.	T	260	70.5	109	29.5
14.	Being overweight people is increasing the risk of heart disease.	T	336	91.1	33	8.9
15.	Regular exercise reduces heart disease risk.	T	326	88.3	43	11.7
16.	Exercising only in the gym reduces the risk.	F	250	67.8	119	32.2
17.	Slow walking and wandering are also considered to be exercises.	F	127	34.4	242	65.6
18.	Stress, grief, and sadness increase the risk of heart disease.	T	315	85.4	54	14.6

19.	The human body raises blood pressure in stressful situations.	T	330	89.4	39	10.6
20.	High blood pressure is a risk factor for heart disease.	T	347	94.0	22	6.0
21.	Keeping under controlling blood pressure reduces the risk of heart disease.	T	320	86.7	49	13.3
22.	Blood pressure patients should use his/her medicine for life.	T	276	74.8	93	25.2
23.	High cholesterol is a risk factor for heart disease.	T	332	90.0	37	13.0
24.	If HDL is high there is a risk of heart disease.	F	175	47.4	194	52.6
25.	If LDL is high there is a risk of heart disease.	T	235	63.7	134	36.3
26.	Everyone with high cholesterol is given medication.	F	154	41.7	215	58.3
27.	Diabetes is a risk factor for heart disease.	T	305	82.7	64	17.3
28.	The risk is reduced if diabetes patients have sugar control.	T	317	85.9	52	14.1

The findings as indicated from above table show that majority of the students had a proper perception of main risk factors of heart disease. For instance, they were accurate in pointing that high blood pressure being a big risk (94.0 %), most of them answer that being overweight increases the chance of CVD (91.1%), old people are more likely to had heart disease (90.0 %), and exercising help in prevention of it (88.3%). The finding shows that 85.4% of the students knew the presence of stress and emotions influences CVD, whereas 86.4 percent of the students understood the need of taking fruits and vegetables every day. From the analysis it was shown that 88.1% of the students were knowledgeable that high blood pressure is a result of excessive amount of salt and 86.7 percent knew that controlling high blood pressure minimizes chances of CVD.

However certain gaps in knowledge were present where only 47.4% of students properly knew that high level of HDL (the good cholesterol) was not a factor which contributed to heart diseases and just 41.7 percent students knew that not every individual with high cholesterol needed a medicine. Moreover, most students (65.6%) failed to identify slow walking and wandering as legitimate types of physical activity, and more than a half of students (52.3%) were not aware of the fact that eating red meat more than thrice a week might be risk able to cardiac health. There were misconceptions pertaining to the utility of solids fats in the room temperature and the disparity between HDL and LDL cholesterol as well.

Figure 1: Histogram of total CVD KNOWLEDGE SCORE



The histogram in the above figure presents the distribution of overall scores of CVD knowledge among nursing students (N =369). The average score was 20.08 (SD = 3.25) and distribution was not normal as the Shapiro-Wilk test revealed (p = 0.000).

Scale	N	%	Mean ± SD	Min	Max
Total	369	100%	20.10± 3.25	9.00	27.00

In general, the findings listed in above table revealed that nursing students possessed moderate to good knowledge about cardiovascular disease (CVD) risk factors. The minimum and maximum of the total CARRF-KL Scores of the students were 9 and 27, respectively and the average total scores were 20.10 with SD of 3.25.

Table: 4 Tests of normality

The table below shows the normality tests results in the total CVD knowledge scores. The Kolmogorov-Smirnov and the Shapiro-Wilk tests suggested statistically significant outcomes ($p < 0.001$), so it could be assumed that the scores distribution is highly different than the normality. Thus, inferential analyses were made with the use of non-parametric tests.

Table 4. Socio-demographic associated with Carrf-KL scale (U) (n=369)

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Total_CVD_Knowledge_Scores	.167	369	.000	.931	369	.000
a. Lilliefors Significance Correction						

		n	Mean ± SD	Median	u	p*
Religious Background	Muslim	356	20.13± 3.20	21.0	1843.0	0.209
	Christian	13	18.69 ± 4.23	20.0		
Gender	Female	109	18.64± 2.68	20.0	9320.0	**<0.001**
	Male	260	20.68± 3.64	21.0		
Marital Status	Single	339	20.26 ± 3.12	21.0	3492.0	**0.004**
	Married	30	18.03 ± 3.93	18.5		
Year (Class)	Year 3	187	19.98 ±3.49	21.0	17013.5	0.997
	Year 4	182	20.18 ±2.98	21.0		
Chronic Disease	No	332	20.18 ± 3.13	21.0	6895.0	0.218
	Yes	37	19.21 ± 4.13	20.0		
Do you know CVD	Yes	257	20.16 ± 3.11	21.0	14028.0	0.697
	No	112	19.8 ± 3.54	21.0		
Family History	No	273	19.8 ± 3.48	21.0	12397.0	0.428
	Yes	96	20.53 ± 2.43	21.0		
Pay attention to nutrition	Yes	247	20.08 ± 3.19	21.0	15217.5	0.875
	No	122	20.07 ± 3.37	21.0		
Do you Smoke	No	341	20.09± 3.23	21.0	4817.0	0.936
	Yes	28	19.92± 3.51	20.5		
Do you Exercise	Yes	251	19.96± 3.25	21.0	15613.5	0.396
	No	218	20.93± 3.24	21.0		
Family History (first degree)	No	289	20.06 ± 3.32	21.0	11424.5	0.872
	Yes	80	20.16 ± 2.98	21.0		

In order to determine whether sociodemographic factors impacted the knowledge about CVD risk factors among the students, the Mann-Whitney U test was applied. As illustrated in the table, above the average scores of the male students (20.68± 3.64) were found to be higher than the average scores of the female students (18.64±2.68). The difference between the scores of the two groups was found significant ($p < 0.001$), thereby showing that male students had more knowledge about the risk factors of cardiovascular diseases. In case of marital status, significant difference was observed between the students who were single and those that were married where single students scored higher (20.26±3.12) and married students scored lower (18.03 ± 3.93) ($p = 0.004$).

Figure 2: Total_CVD_Knowledge_Scores across Gender

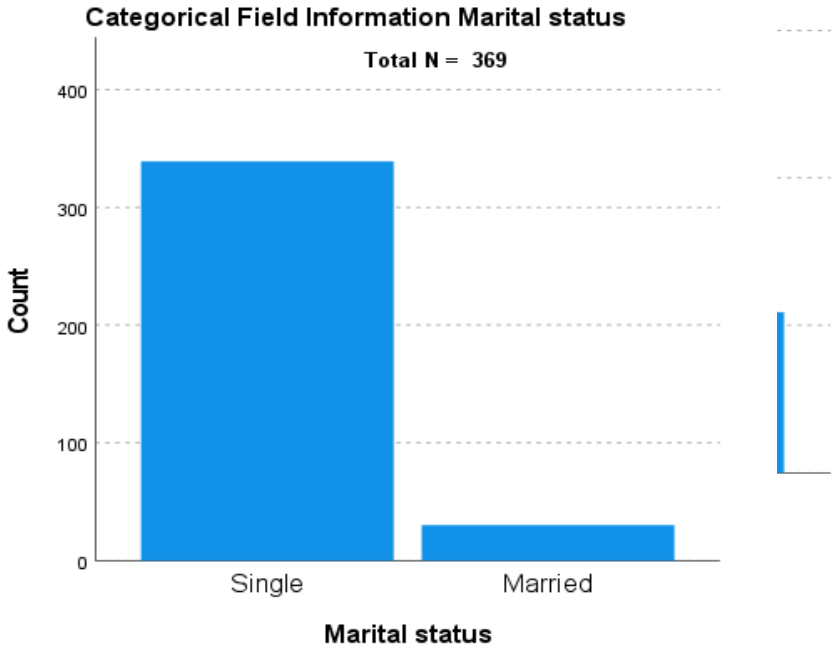


Figure 3: Total_CVD_Knowledge_Scores across Marital status

The mean of the scores of Muslim students was slightly, but significant higher (20.13±3.20) compared to the Christian students (18.69±4.23), but again, it did not represent a statistically significant difference ($p = 0.209$). Students in Year 3 and Year 4 did not show any significant differences in knowledge scores, neither those with nor those without chronic disease, nor students whose parents told them about CVD. Similarly, the presence of a family history of CVD, attention to nutrition, smoking status, and exercise habit did not have significant impact on the level of knowledge of students (all $p > 0.05$). The rest of the variables did not have significant differences pointing to the conclusion that the knowledge of CVD has a rather uniform distribution across a broad range of demographic and lifestyle factors among the chosen sample of nursing students.

Table 5. Socio-demographic associated with Carrf-KL scale (X)

		n	**Mean ± SD**	**Median**	**X**	***p***
Salt	Less Salty	269	19.97 ± 3.42	20.0	3.358	0.187

Consumption	Without	30	19.53 ± 3.12	21.0		
	Salty	70	20.72 ± 2.47	21.0		
Oil Products Prefer	Vegetables	235	20.18± 3.19	21.0	0.848	0.654
	Olive Oil	99	19.81 ± 3.60	20.0		
	Butter	35	20.17± 2.51	20.0		
Do You Drink Alcohol	No	368	20.07± 3.25	21.0	0.551	0.458
	Yes	0	undefined	undefined		
	Sometimes	1	22.00±undefined	22.0		
Evaluate Your Health	Good	226	19.99± 3.26	21.0	1.309	0.520
	Medium	135	20.30± 3.19	21.0		
	Bad	8	19.00 ± 3.77	20.0		
Institute	**Farkhanda institute of nursing and public health**	92	19.70 ± 3.92	20.50	1.735	0.629
	Rufaidah Nursing College, Peshawar.	93	20.35 ± 2.52	21.00		
	Rehman College of Nursing, Peshawar	92	20.57± 2.53	21.00		
	Northwest College of Nursing, Peshawar	92	19.69±3.71	21.00		

To compare cardiovascular disease (CVD) knowledge scores in terms of various categories of some variables, Kruskal Wallis test was employed as shown from above table . As far as salt consumption is concerned, the mean score was slightly higher among the students who reported eating salty food (20.72 as opposed to 19.97 and 19.53 respectively in the less salty and without salt groups) though there is no statistically significant difference between the 3 groups ($p = 0.187$). Comparably, no significant variations were observed in relation to the kind of oil product to be preferred in the diet ($p = 0.654$). There is a special case While considering alcohol use, almost all students ($n = 368$) reported that they did not drink alcohol, but only one student selected "sometimes." As there were no regular alcohol consumers, which makes the groups highly unequal, this variable could not be meaningfully analyzed, and the result was not statistically significant ($p = 0.458$). There was also no significant difference in knowledge score based on the self health evaluation by students classified as good, medium, or bad ($p = 0.520$). Finally, when the students of the four disparate nursing colleges were compared, differences in mean scores were statistically insignificant ($p = 0.629$) and didn't have significant association with CVD knowledge scores . These

results show that there was no significant difference between the CVD knowledge scores across these lifestyle and institutional indicators.

Discussion

In this study the findings showed that there was a moderate level of knowledge among nursing students with a mean score of 20.10 with Standard Deviation of 3.25 which reflect adequate level of knowledge about major cardiovascular health principles, among nursing students, but it also signals a gap in knowledge where improvement is required. Similar result was shown by recent study in Turkey among undergraduate nursing students which also reported same level of knowledge score which is about 20.93 (SD 4.31) and 21.08 (SD 2.70), respectively, indicating moderate a awareness about CVD. (Gürel, 2023)(Mohebi et al., 2018)**.** Similarly another study conducted in Iraq indicated same moderate awareness among nursing students (*Elicit: Study Which Show Moderate Awareness about Cardiovascular Disease and Its Risk Factors among Nursing Students and Also Which Show Lower Awareness about That Too*, n.d.). In this study the knowledge among nursing students was moderate maybe due to the reason that all the students were taken from 3rd and 4th year and they had already studied in medical and surgical books and in other seminars which are about CVD. Students also had good awareness about hypertension, obesity, age, stress and unhealthy diet. Along with these strengths, some misconceptions emerged when the responses are considered. A large number of students had low awareness about high-density lipoprotein (HDL) cholesterol because only 47.4% identified correctly that it was protective and not a risk factor of Caardiovascular disease Similar result was show by recent study in Egypt in which nursing students are confused about HDL and LDL(Adel et al., n.d.). Similarly, 41.7% of the students answered correctly by stating that not every person with high cholesterol levels needs medication. As the comparison of demographically distinct groups showed, there was a statistically significant difference in the extent of knowledge. The average score of male students exceeded that of female students (20.68 ± 3.64) and it is significantly higher ($p < 0.001$). This study is also consistent with the past study which discovered that male nursing students in Turkey scored significantly higher on CVD knowledge assessments as compared to female students (Badir et al., 2015). But this contrast with recent study in Egypt where female students had more knowledge as compare to male students (Adel et al., n.d.). Similarly, the marks of single students was higher (20.26 ± 3.12) in comparison to their married counterparts (18.03 ± 3.93) and also it was found to be significant ($p = 0.004$). These trends indicate gender and marital status can determine a student receiving or consuming educational content on their health regarding cardiovascular health. However, this further confirms the understanding that cardiovascular differences in terms of gender might be found in different contexts which might vary due to sample representativeness and cultural or educational variation. Conversely, other demographic factors like religious background, chronic disease or prior knowledge of cardiovascular disease did not show statistically significant difference. The approach of the students to the systematic method of learning was slightly higher among Muslim students (20.13 ± 3.20) than the Christian students (18.69 ± 4.23) although this was not significant ($p = 0.209$). And students that had a chronic disease scored 19.21 along with SD of 4.13 which is ever so slightly lower than those that did not have chronic disease (20.18 ±3.13), but once again not with statistical significance ($p = 0.218$). CVD awareness also did not demonstrate a significant effect on the level of knowledge ($p = 0.697$).

Academic boost, like it usually happens, showed minimal variations. The mean score was a little higher in fourth-year students (20.18± 2.98) than in the third-year students (19.98±3.49), although this did not reach statistical significance ($p = 0.997$). This can be a pointer to the fact that as much as knowledge accumulates with time, the increase is not significant unless therein targeted interventions. Such lifestyle choices as exercise and nutritional awareness were also insignificantly correlated with the level of knowledge. Likewise, nutritional focus reflected an insignificant change in their scores

(p = 0.875). These findings are either a gap between health knowledge and behavior or deficiency in self-reported lifestyle information. In analyzing the dietary behavior, there was no statistically significant relationship between knowledge and consumption of salt (p = 0.187). Although the average score among students reporting some intake of salty food (20.72±2.47) was slightly higher than the average score between the students reporting moderate salty food intake (19.97 ± 3.42) and no salt food intake (19.53± 3.12), the results did not identify a significant correlation between salt intake behavior with CVD knowledge. This is totally in contrast to the recent study which found that there is a strong relationship exist between salt intake and other existent factors such as weight, high blood pressure, blood sugar elevation, and hypercholesterolemia.(Linder et al., 2023) Favorite cooking oil (vegetable oil, olive oil, and butter) was not ranked with substantial differences as far as knowledge scores were concerned (p = 0.654). This regularity could represent a fundamental degree of recognition which goes beyond individual dietary preferences. Alcohol use could not be meaningfully investigated because the prevalence of alcohol use among participants was overwhelmingly low alcohol use, and only 1 student identified themselves as occasionally consumed it. Consequently, a lack of significant associations was noted (p = 0.458. Perception of health status also showed no statistically significant finding. There was no statistically significant difference between students who rated their health to be good, medium or poor with p = 0.520 with a mean score of 19.99 (SD 3.26) (good), 20.30 (SD 3.19) (medium), and 19.00 (SD 3.77) (poor), respectively. It indicates that subjective health assessment is not highly correlated with concrete understanding of risk factors of CVD. There was no significant relationship between cardiovascular disease family history (in general or only first-degree relatives) with the level of knowledge. Personal exposure to cardiovascular disease did not seem to improve knowledge. The mean scores of students whose relatives were subjected to CVD matched those of students without such a background (20.16±2.98 vs. 20.06 ± 3.32; p = 0.872). There were slight differences in the comparisons of the four colleges of nursing that participated in the research in terms of institutions. The mean score was the highest in the Rehman College of Nursing (20.57 ± 2.53) and Northwest College of Nursing had the lowest (19.69 ± 3.71), though the difference between the two were not significant (p = 0.629). This uniformity indicates that there is a generally standard level of cardiovascular disease training within the institutions used in the study.

Conclusion:

Although moderate level of knowledge was possessed by nursing students, but certain deficiencies in knowledge still exist especially when male and female, married and single students' knowledge were assessed where significant association were found and also some misconception exist when impact of HDL and LDL on CVD knowledge were assessed, which emphasize the need for targeted educational programs and curriculum enhancement for better prevention of cardiovascular disease

Recommendations

Based on the findings of this study, it is recommended that nursing curricula be strengthened to address the identified gaps in knowledge related to CVD risk factors, particularly in areas of diet, physical activity, and preventive measures. Incorporating comprehensive, evidence-based educational content and structured learning interventions can help improve students' understanding of these critical concepts. In addition, targeted strategies such as workshops, interactive sessions, and flexible learning approaches should be considered to support groups with relatively lower knowledge levels, including female and married students. Encouraging active participation in public health campaigns and awareness programs may also enhance students' practical understanding, communication skills, and role in community health promotion. Furthermore, strengthening mentorship and providing practical training opportunities can better prepare nursing students to effectively contribute to the prevention and management of cardiovascular diseases. Future researchers are

encouraged to build upon these findings by conducting studies with larger sample sizes and across multiple institutions to improve the generalizability and depth of understanding in this area.

Limitations

The study has some limitation because it is carried on just four private nursing institute in Peshawar rather than carrying research on all so, we cannot generalize it to all private nursing institute. There may be possibility of response bias because the questionnaire contains questions with just answers yes or no option. The use of descriptive cross-sectional study design in research limits it capability to determine the cause and effects relationships.

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