ORIGINAL ARTICLE

Awareness and Acceptance of Premarital Screening Test and Genetic Counseling Program in Riyadh area, Saudi Arabia

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ABSTRACT

Background: Saudi Arabia has a high prevalence of hereditary diseases such as thalassemia and sickle cell disease that estimated the prevalence of 1.5%-17% for each β-thalassemia and SCD respectively according to the general statistics organization. For that Saudi Arabia implemented Premarital screening and genetic counseling (PMSGC) program, since 2004, which aims to limit the spread of some genetic blood diseases and infectious diseases along with reducing pressure over health institutions, avoiding the social and psychological problems for families whose children suffer and reducing the family and community's financial burdens.

Objective: The study aimed to assess the knowledge, awareness, acceptance, and attitude of the national premarital screening programs in Al-Riyadh area, Saudi Arabia.

Methodology: A cross-sectional community-based study was conducted among 564 participants from the ages of 18 and over across 8 cities in the Riyadh area, Saudi Arabia from October 2019 to April 2020. Data collected by pretested preceded paper and electronic questionnaire, which consist of three main parts. The first part focused on respondents' sociodemographic and general characteristics, the second part was concerned with knowledge and awareness while the third part explored attitude towards the national PMSGC program.

Results: The overall knowledge level among the participants was 35.8% had good knowledge, 35.1% had moderate knowledge and 29.1% had poor knowledge. A significant association between the level of knowledge and both age and marital status groups was observed (p = 0.005) and (p = 0.014) respectively. The participants group with 31-40 age and the married group had the best knowledge compared to the other groups. The overall awareness level was 36.5% had good awareness, 49.8% had moderate awareness, while only 13.7% had poor awareness. A significant association between the level of awareness and level of education was observed (p = 0.041), which revealed that the level of an educated group with the best awareness level was College-educated participants. Out of 564 participants, 542 (96.10%) support and accept PMSGC in Saudi Arabia along with 92.38% of participants who had a positive attitude toward the program.

Conclusion: This study highlights that knowledge of the general population in the Al Riyadh area regarding the PMSGC program was good, while they have a moderate awareness regarding the program. These results indicate that there is a need for more information and education regarding the PMSGC program.

Keywords: Premarital screening test, Genetic counseling, Riyadh, Saudi Arabia, Awareness, Acceptance

INTRODUCTION

Premarital screening (PMS) is the process of screening couples who are expecting to marry in the near future for common inherited blood abnormalities and infectious infections. Premarital screening and genetic counseling (PMSGC) aim to reduce the spread of some genetic blood diseases (e.g., sickle-cell anemia (SCA) and thalassemia) as well as infectious diseases (e.g., hepatitis B (HBV), hepatitis C (HCV), and HIV/AIDS) by raising awareness about the concept of a comprehensive healthy marriage, reducing pressure on health institutions and blood banks, avoiding social and psychological problems for families [1].

Many countries have implemented premarital testing programs that are mandatory. On the other hand, today's ethical dilemmas present themselves in a variety of ways, depending on culture, tradition, and religion. The most fundamental ethical difficulties in premarital testing are mandatory testing and maintaining secrecy. Regardless of these ethical concerns, premarital testing is an excellent technique for preventing disease transmission and improving individual and societal quality of life [2]. Simple blood tests are used to do premarital screening at approved Marriage Consultation Centers. The couple's blood is utilized to do the following tests: complete blood count (CBC), sickle cell test, hemoglobin electrophoresis, and HIV, HBV, and HCV screening [3, 4].

Genetic abnormalities are rapidly becoming a serious public health concern in several parts of the world, according to available epidemiological statistics. In 2012, the World Health Organization estimated that about 5% of the global population has trait genes for hemoglobin diseases, primarily SCD and thalassemia]5-7[.

In the Gulf region, inherited blood disorders (specifically, thalassemia and SCD) are highly prevalent and cause great suffering to afflicted children in these countries [7- 10].

Up to 45% of the population in the Eastern region of KSA is heterozygous for α-thalassemia (α-thal). However, because no biochemical diagnostic test is available for the detection of α-thal carriers, and because red cell morphology may be quite reasonable in hemoglobin

electrophoresis, the PMS program does not include this condition [10].

In Jeddah, A stratified random sampling was conducted among the students at King Abdulaziz University and most of the students at KAU have good general knowledge concerning hereditary diseases but had inadequate knowledge in relation to the national PMS program [11].

Since the beginning of the application of the PMSGC program, much research and studies have been conducted, that aims to measure the response and awareness of Saudi society towards the PMS test. El-Hazmi conducted a community-based attitude study and found that 94% of the participants considered premarital testing and counseling to be important in preventing genetic blood diseases, whereas 87% thought testing should be mandatory [12].

The objective of this study was to assess the awareness and acceptance of premarital screening test in Riyadh area, Saudi Arabia, 2020, along with assessing the community knowledge in Riyadh region towards the PMSGC program.

METHODOLOGY

Study design: Cross-sectional community-based study to assess the awareness, knowledge, attitude, and acceptance of PMSGC program in Riyadh area, 2019-2020.

Study area: Riyadh region also called the central region, is located in the center of the KSA. It includes 19 governorates. The emirate's headquarters is based in Riyadh City. This study data was collected from Al-Riyadh, Al-Dawadmy, Al-Majma'ah, Hotat Sudhir, Al-Zulfi, Al-Ghat, Al-Muzahmeya, and Thadig.

Study population: All married, intending spouses and single women and men who are from the ages of 18 and over.

Sampling

Sample type: Cluster sampling.

Sample size: The sample size as calculated to be 384 taking the estimated prevalence of 50% with 5% margin error in a 95% confidence interval. The total number of respondents was 653, after excluding respondents who did not meet the study criteria, the total number of participants was reduced to 564. The study participants were selected by sample random sampling technique.

Inclusion criteria: Saudi males and females of all educational levels, married or unmarried, over the age of 18 in the Riyadh area were included.

Exclusion criteria: Participants who were under the age of 18 or outside our study area will be excluded from this study.

Data collection: Data was collected by using a self-administered pretested pre-coded questionnaire in paper and online form. Paper questionnaires were distributed among students and staff of the College of Medicine and Applied Medical Sciences at Majmaah University. After taking the participants' consent, the questionnaire consisted of 3 main parts; the first 9 questions include questions about socio-demographic data and general participants' characteristics, the second part dealt with the participant's knowledge and awareness about the PMSGC

program while the third part explored their attitudes and acceptance towards the screening program. In the second and third parts, 1 point was given for every correct answer. The knowledge and awareness section contained 6 questions for knowledge and 9 for awareness. For knowledge, the maximum score a participant could obtain was 6 points (good knowledge 6–5 points, moderate knowledge 4–3 points, poor knowledge 2–0 points). For awareness, the maximum score a participant could obtain was 9 points (good awareness 9–7 points moderate awareness 6–5 points, poor awareness 4–0 points. The attitude section contained 7 questions. The maximum score a participant could obtain in this section was 7 points (positive attitude, 7–4 points, negative attitude, 3–0 points).

Variables: Age, sex, marital status, educational level, governorate, and type of marriage having hereditary diseases and hemoglobinopathy were the identified variables.

Ethical considerations: The study was approved by Majmaah University for Research Ethics committee. Informed consent was provided at the beginning of the questionnaire in Arabic with details informing the participants about the purpose of the research. The participants' identities were kept anonymous. No coercion, incentives, or rewards were used for the participants who did not wish to participate. Private and personal information was not and will not be disclosed during or after the study.

Statistical Methods of Analysis: The data were analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0 software. Frequency and percentage were used to describe qualitative variables. Bivariate analysis association between the frequencies of each socio-demographic characteristic and the levels of knowledge, awareness, and attitude was performed using cross-tabulation. Pearson chi-squared test, a p-value ≤ 0.05 was used to report the statistical significance.

RESULTS

The socio-demographic characteristics of the participants are presented in **Table 1**. The overall study population was 564 individuals who fill the questionnaire across the 8 cities in the Riyadh area, Saudi Arabia.

Table 1: Characteristics of participants in this study, PMSGC, Riyadh area, Saudi Arabia, 2020 (n= 564).

Variables	Frequency	Percentage (%)
Gender		
Male	84	14.9
Female	480	85.1
Age		
18-20	96	17.0
21-30	191	33.9
31-40	156	27.7
> 40	121	21.5
Marital status		
Single	196	34.8
Married	329	58.3
coming to marriage	39	6.9
Level of education		
Primary education	9	1.6
Secondary education	17	3.0
High school graduate	103	18.3
Collage education	414	73.4
Advanced degree	21	3.7
If you are married/coming to marriage, is its consanguineous marriage?		
Yes	110	19.5

No	258	45.7
Not Applicable	196	34.8
If you are married/coming to marriage, did you have PMS test?		
Yes	184	32.6
No	160	28.4
Not Applicable	220	39.0
Do you have a family member with genetic or hereditary blood diseases?		
Yes	66	11.7
No	404	71.6
Not Applicable	94	16.7
Do you have any genetic or hereditary blood diseases?		
Yes	18	3.2
No	523	92.7
Not Applicable	23	4.1
If yes, specify the disease.		
Thalassemia	5	0.9
Sickle cell	10	1.8
Others	19	3.4
Not applicable	505	89.5

The predominant number of participants 480 (85.1%) were female and 84 (14.9%) were male. Furthermore, a higher proportion of participants (33.9%) were in the 21-30 age group, and 27.7% were between 31–40 years. The majority of participants were married (n = 329, 58.3%), college students or graduate (n= 414, 73.4%).

For the participants' place of residence, 43.9% of the respondents were from Riyadh, 26.4% were from Al-Zulfi, 24.5% were from Al-Majma'ah and 5.1% were from other governorates of the Riyadh region **(Figure 1)**.
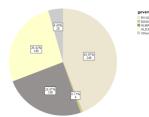

Figure 1: Participants' place of residence, PMSGC, Riyadh area, Saudi Arabia, 2020 (n= 564).

The study shows only 110 (19.5%) of the participants reported that there was a relative relation between them and their partners (consanguineous marriage). Approximately, 32.6% of participants did have a PMS test (**Table 1**). Family history and personal history of hereditary blood diseases were reported by 11.7% and 3.2% of respondents, respectively. 10 (1.8%) had SCD, 5% (0.9) had Thalassemia and 3.4% had other diseases.

Table 2: Association between who did PMS test and age group, Riyadh area, Saudi Arabia, 2020 (n= 564).

Age	If you are married/coming to marriage, did you have PMSGC n (%)			Total n (%)	P value
	Yes	No	Not applicable		
18-20	9 (4.9)	1 (0.6)	86 (39.1)	96 (17.0%)	<0.001
21-30	71 (38.6)	4 (2.5)	116 (52.7)	191 (33.9%)	
31-40	87 (47.3)	54 (33.8)	15 (6.8)	156 (27.7%)	
> 40	17 (9.2)	101 (63.1)	3 (1.4)	121 (21.5%)	

The Chi-square test showed a significant association between those who did PMS test and the age group (p < 0.001). Interestingly, the best practice was observed in the

age group 21-30 years, showed that 71 (38.6%) had done the test while only 4 (2.5%) had not to do it, compared to >40-years group were only 17 (9.2%) had done the test and 101 (63.1%) had not to do it **(Table 2)**.

Table 3: Knowledge of participants about PMSGC program, Riyadh area, Saudi Arabia, 2020 (n= 564).

Knowledge item	Frequency	Percentage (%)
Have you heard about PMSGC program in Saudi Arabia?		
Yes	555	98.4
No	9	1.6
Source of information about PMSGC program		
Society, Family and friends	351	62.2
Healthcare services	135	23.9
School subjects	69	12.2
Is PMS test including Thalassemia test?		
Yes	190	33.7
No	10	1.8
Don't know	364	64.5
Is PMS test including HBV test?		
Yes	276	48.9
No	13	2.3
Don't know	275	48.8
Is PMS test including HIV and AIDS test?		
Yes	356	63.1
No	16	2.8
Don't know	192	34.0
Is PMS test including SCD test?		
Yes	292	51.8
No	11	2.0
Don't know	261	46.3
The treatment of hereditary blood diseases is readily available?		
Yes	110	19.5
No	108	19.1
Don't know	346	61.3

Table 4: Level of knowledge in association with study variables (gender, age, marital status, and level of education), Riyadh area, Saudi Arabia, 2020 (n= 564).

Study Variables	Knowledge n (%)			Total n (%)	P value
	Good	Moderate	Poor		
Gender					
Male	38 (18.8)	31 (15.7)	15 (9.1)	84 (14.9)	0.033
Female	164 (81.2)	167 (84.3)	149 (90.9)	480 (85.1)	
Age					
18-20	20 (9.9)	41 (20.7)	35 (21.3)	96 (17.0%)	0.005
21-30	62 (30.7)	68 (34.3)	61 (37.2)	191 (33.9%)	
31-40	64 (31.7)	50 (25.3)	42 (25.6)	156 (27.7%)	
> 40	56 (27.7)	39 (19.7)	26 (15.9)	121 (21.5%)	
Marital status					
Single	52 (25.7)	82 (41.4)	62 (37.8)	196 (34.8%)	0.014
Married	136 (67.3)	104 (52.5)	89 (54.3)	329 (58.3%)	
coming to marriage	14 (6.9)	12 (6.1)	13 (7.9)	39 (6.9%)	
Level of education					
Primary education	5 (2.5)	2 (1.0)	2 (1.2)	9 (1.6)	0.715
Secondary education	6 (3.0)	6 (3.0)	5 (3.0)	17 (3.0)	
High school graduate	34 (16.8)	41 (20.7)	28 (17.1)	103 (18.3)	
Collage education	146 (72.3)	143 (72.2)	125 (76.2)	414 (73.4)	
Advanced degree	11 (5.4)	6 (3.0)	4 (2.4)	21 (3.7)	

A total of 555 (98.4%) participants had heard about PMGC. When asked about their main source of knowledge regarding PMGC, 351 study participants (62.2%) chose society (family and friends), 135 (23.9%) chose healthcare services, and only 69 (12.2%) participants chose school subjects. Regarding the target diseases by PMS, only 190 (33.7%) know that thalassemia included in the PMS test, SCD was recognized by only 292 (51.8%). While the majority of the respondents answered correctly about the inclusion of HIV in PMS test 356 (63.1%). Only 110 (19.1%) of participants knew that the treatment of hereditary blood diseases is not readily available **(Table 3)**.

The data showed out of the 564 participants who answered 6 questions about PMS, 202 (35.8%) had good knowledge, 198 (35.1%) had moderate knowledge while 164 (29.1%) had poor knowledge.

The Chi-square test showed a significant association between the level of knowledge and age groups (p = 0.005). The age group with the best knowledge was 31-40 years, with 64 (31.7%) out of 156 (27.7%) participants scoring 'good' for knowledge, followed by 20-30 age group, where 62 (30.7%) out of 191 (33.9%) participants scoring 'good' for knowledge. The worst was 18-20 years, with only 20 (9.9%) out of 96 (17.6%) participants scoring "good" for

knowledge. Also, a significant association was observed between the level of knowledge and gender (p = 0.033), showing that females had better knowledge than males, with 164 (81.2%) out of 480 (85.1%) female participants scoring 'good' for knowledge compared to male participants 38 (18.8%) out of 84 (14.9%). Moreover, A significant association was observed between the level of knowledge and marital status (p = 0.014), showing that the married group got the highest score for 'good' knowledge 136 (67.3%) out of 329 (58.3%) participants compared to the other groups. The other study variables showed no significant associations **(Table 4)**.

It is realized from **Table 5** that, out of 564 participants, 161 (28.5%) and 121 (21.5%) respectively, were aware of the PMS test time. While 302 (53.5%) strongly agree that the PMS test was carried out before engagement. 219 (38.8%) and 109 (19.3%) of participants believed that consanguineous marriages are one of the main causes of hereditary diseases. 214 (37.9%) and 215 (38.1%) of the participant agreed and strongly agree respectively, that PMS prevent offspring from having hereditary diseases. 325 (57.6%) of participants strongly agree that the PMS test is safe and has no complications. 264 (46.8%) and 210 (37.2%) of participants respectively, knew where PMS was carried out.

Table 5: Awareness of participants toward PMSGC program, Riyadh area, Saudi Arabia, 2020 (n= 564).

Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	n (%)	n (%)	n (%)	n (%)	n (%)
The appropriate time for PMSGC before the engagement	20 (3.5)	69 (12.2)	71 (12.6)	102 (18.1)	302 (53.5)
The appropriate time for PMSGC after the engagement	101 (17.9)	132 (23.4)	49 (8.7)	121 (21.5)	161 (28.5)
The main cause of hereditary diseases is consanguineous marriages	7 (1.2)	62 (11.0)	167 (29.6)	219 (38.8)	109 (19.3)
Knowing the health history of those coming to marriage helps provide early treatment and prevents many complications for offspring	4 (0.7)	5 (0.9)	26 (4.6)	212 (37.6)	317 (56.2)
PMS is avoiding me to have children with hereditary disease	23 (4.1)	31 (5.5)	81 (14.4)	214 (37.9)	215 (38.1)
PMS is among the most important means of controlling the spread of hereditary diseases	9 (1.6)	12 (2.1)	31 (5.5)	214 (37.9)	298 (52.8)
PMS safe and has no complications	5 (0.9)	7 (1.2)	35 (6.2)	192 (34.0)	325 (57.6)
The emergence of infected genes does not hinder the marriage	65 (11.5)	139 (24.6)	184 (32.6)	116 (20.6)	60 (10.6)
I know where PMS carried out.	10 (1.8)	38 (6.7)	42 (7.4)	264 (46.8)	210 (37.2)

Table 6: Level of Awareness in association with study variables (gender, age, marital status, and level of education), Riyadh area, Saudi Arabia, 2020 (n= 564).

Study Variables	Awareness n (%)			Total n (%)	P value
	Good	Moderate	Poor		
Gender					
Male	30 (14.6)	37 (13.2)	17 (22.1)	84 (14.9)	0.149
Female	176 (85.4)	244 (86.8)	60 (77.9)	480 (85.1)	
Age					
18-20	27 (13.1)	52 (18.5)	17 (22.1)	96 (17.0%)	
21-30	60 (29.1)	104 (37.0)	27 (35.1)	191 (33.9%)	0.081
31-40	70 (34.0)	69 (24.6)	17 (22.1)	156 (27.7%)	
> 40	49	56	16	121	

	(23.8)	(19.9)	(20.8)	(21.5%)	
Marital status					
Single	62 (30.1)	104 (37.0)	30 (39.0)	196 (34.8%)	
Married	133 (64.6)	155 (55.2)	41 (53.2)	329 (58.3%)	0.244
coming to marriage	11 (5.3)	22 (7.8)	6 (7.8)	39 (6.9%)	
Level of education					
Primary education	5 (2.4)	4 (1.4)	0 (0.0)	9 (1.6)	
Secondary education	8 (3.9)	7 (2.5)	2 (2.6)	17 (3.0)	
High school graduate	28 (13.6)	56 (19.9)	19 (24.7)	103 (18.3)	0.041
Collage education	151 (73.3)	209 (74.4)	54 (70.1)	414 (73.4)	
Advanced	14	5	2	21 (3.7)	

degree	(6.8)	(1.8)	(2.6)		

Out of 564 participants, 206 (36.5%) had a good awareness of the PMSGC program in Saudi Arabia, while 281 (49.8%) had moderate awareness and only 77 (13.7%) had a poor awareness.

The statistical analysis finds out a significant association between level of awareness and level of education (p = 0.041), revealed that the educational level group with the best awareness score was the College-educated group with 209 (74.4%) out of 414 (73.4%) participants scoring 'Moderate' for awareness followed by

73.3% score 'Good'. The other study variables showed no significant associations **(Table 6)**.

Out of 564 participants, 225 (39.9%) disagree with the idea that hereditary disease is a family secret. A total of 159 (28.2%) participants were neutral about "If I have a genetic disease do not refuse to marry a person who is a carrier for the same genetic disease", while 121 (21.5%) strongly disagree about it. Regarding tests suggested by the participants to be added to the PMS test, drug screening represented had the highest rate (78.9%) followed by psychological diseases (68.3%). 56.6% agreed to add the family medical history to the PMSGC program **(Table 7)**

Table 7: Attitudes of participants towards PMSGC program Riyadh area, Saudi Arabia, 2020 (n= 564)

Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	n (%)	n (%)	n (%)	n (%)	n (%)
Having a hereditary disease is considered a family secret	83 (14.7)	225 (39.9)	116 (20.6)	91 (16.1)	49 (8.7)
I support PMSGC	6 (1.1)	4 (0.7)	12 (2.1)	138 (24.5)	404 (71.6)
PMS disrupts young man or women from marriage	153 (27.1)	305 (54.1)	56 (9.9)	34 (6.0)	16 (2.8)
If I have a hereditary disease, I do not refuse to marry a person who is a carrier for the same genetic disease	121 (21.5)	162 (28.7)	159 (28.2)	65 (11.5)	57 (10.1)
I support adding the drug screening to the PMSGC	3 (0.5)	2 (0.4)	23 (4.1)	91 (16.1)	445 (78.9)
I support adding the family's medical history to the PMSGC	6 (1.1)	29 (5.1)	64 (11.3)	140 (24.8)	325 (57.6)
I support the addition of a psychiatric examination such as schizophrenia and depression to PMSGC	8 (1.4)	13 (2.3)	48 (8.5)	110 (19.5)	385 (68.3)

Table 8: Level of Attitude in association with study variables (gender, age, marital status and level of education), Riyadh area, Saudi Arabia, 2020 (n= 564).

Study Variables	Attitude n (%)		Total n (%)	P value
	Positive	Negative		
Gender				
Male	73 (14.0)	11 (25.6)	84 (14.9)	
Female	448 (86.0)	32 (74.4)	480 (85.1)	0.041
Age				
18-20	87 (16.7)	9 (20.9)	96 (17.0%)	
21-30	174 (33.4)	17 (39.5)	191 (33.9%)	
31-40	149 (28.6)	7 (16.3)	156 (27.7%)	0.375
> 40	111 (21.3)	10 (23.3)	121 (21.5%)	
Marital status				
Single	179 (34.4)	17 (39.5)	196 (34.8%)	
Married	307 (58.9)	22 (51.2)	329 (58.3%)	0.577
coming to marriage	35 (6.7)	4 (9.3)	39 (6.9%)	
Level of education				
Primary education	9 (1.7)	0 (0.0)	9 (1.6%)	
Secondary education	16 (3.1)	1 (2.3)	17 (3.0)	
High school graduate	97 (18.6)	6 (14.0)	103 (18.3)	0.449
Collage education	378 (72.6)	36 (83.7)	414 (73.4)	
Advanced degree	21 (4.0)	0 (0.0)	21 (3.7)	

The collected data showed the overall attitude score of participants from Riyadh area**.** Out of 564 participants, 521 (92.38%) had a positive attitude, while the remaining 43 participants (7.62%) had a negative attitude toward the PMSGC program in Saudi Arabia.

A significant association was observed between the level of attitude and gender (p = 0.041), which indicate that female have a positive attitude toward the PMS (86.0%) more than male (14.0%). No other study variables show any significant associations between them and overall attitude **(Table 8)**.

The results present the acceptance of participants toward PMSGC. Out of 564 participants, 542 (96.10%) support and accept PMSGC in Saudi Arabia.

DISCUSSION

Many nations have begun to realize the importance of premarital counseling as a public health measure. PMSGC is an important mean by which newly married couples can consider marriage and learn about reproductive health. Saudi's PMSGC program is offered free of charge to all Saudi couples planning to get married. However, the population needs more education about it as many studies conducted in our country report that the community has poor knowledge and awareness. According to a study has done in Al-Madinah by *Al-Qahtani et al* reported that half of the study population still had no idea regarding the screened diseases, and they recommended further awareness regarding PMS [13].

Saudi Arabia as well is known for its high prevalence of these diseases. According to the general statistics organization, KSA the estimated prevalence of β-thal and SCD was 1-5%-17% respectively. The prevalence of SCD and β-thal was highest in the eastern region, followed by southern and western regions. This high prevalence could be due to the general endogamy of marriage. The consanguinity marriage is of a high percentage in Saudi Arabia at 56%, 33.6% for first-degree cousins, and 22.4% among other relatives. Nevertheless, studies have proved that 48% of genetically incompatible couples completed their marriage [9].

Secondary data analysis was performed using data from the PMSGC program, housed within the Saudi Ministry of Health's Genetic Department. The estimated prevalence rate for β-thal obtained from this study was 13.6 per 1000, prevalence varied by regions where the highest rate was observed in the Jazan region [10].

Therefore, this study was carried out to assess the knowledge, awareness, acceptance, and attitude of PMS tests among the community in the Al-Riyadh area. A total of 564 participants were enrolled in this study, more than half of the participants were females (85.1%). The results of this study clearly demonstrated that a higher proportion of participants (33.9%) were in the 21-30 age group, this result is similar to what was reported in other studies, including that conducted at hospital King Khalid University Hospital between February 21, 2017, and March 7, 2018 [21]. The majority of participants in this study were married (58.3%) and college students or graduates (73.4%). According to Al‑Qahtani et al, 50.4% of the participant was married and 70.7% had a university education and postgraduate education and this was close to our results [13].

Out of 329 married participants, 32.6% did have a PMS test while 28.4% did not. Taking into consideration that two of the participants mentioned that they married before the decision to conduct a premarital test. This could be a reason for the significant association that showed in our study between who did the test and age groups (p < 0.001), as 33.8% and 63.1% from 30-41 and >40 age groups respectively, did not have the test, compared to 21-30 age group where only 2.5% did not have the test.

The family history of hereditary blood diseases was reported by 11.7% of respondents. These findings are fairly similar to a study conducted in Abha by Al-Khaldi et al where they reported as 10% [14].

In this study, more than two‑thirds of the participants' knowledge was good to moderate (35.8% -35.1%) respectively. The level of knowledge was good among university-educated participants (72.3%), elementary education was 3%. In contrast, 17.1% of high school-educated had poor knowledge and this result is close to a study conducted among 350 Saudi Adults in KKUH [15[. In addition, married participants were more knowledgeable than singles (67.3% versus 25.7%). In another relatively study conducted in Tabuk City among university students, married students were more knowledgeable than singles and divorced students (59.5% Vs 47.8% and 12.5%, respectively) [9[. Besides, a significant association between the level of knowledge and age groups was observed (p = 0.005). Study shows that the 31-40 and 21-30 age group

had the best knowledge, where 31.7% and 30.7% respectively, scoring "good" for knowledge.

A total of 555 (98.4%) participants had heard about PMGC. When asked about their main source of knowledge, 351 study participants (62.2%) chose Society (family and friends). Alghamdi et al in a study conducted among male university students in Riyadh [16] and Al-Qattan et al in a study conducted in KKUH have reported similar results [15]. This reviews the extent of the community's knowledge of this test and likewise reflects the importance of increasing the health campaigns concerned with this issue until the correct information for the PMSGC program reaches the community and from a reliable source.

Regarding the target diseases by PMS, in this study, 51.8% know that HIV and AIDS include in the PMS test. While the majority of the respondents (48.9%) answered correctly about the inclusion of HBV in PMS. This finding is similar to the study conducted in Tabuk city [9[.

This study explores a strong positive attitude toward the Saudi PMS program among the participants from the Riyadh area (92.38%). 72.6% of university-educated participants showed a more positive attitude toward the PMS. This finding is similar to the result of a study conducted at KKUH, where 72.2% of university-educated participants had a positive attitude [15]. It is also important to clarify that in this study there was a significant association between both the level of attitude as well as the level of knowledge and gender (p = 0.041) and (p = 0.033), respectively, where the female had a positive attitude and high knowledge score compared to male. This is due to the fact that more women participate than men.

Moreover, to assess their attitude toward PMS, we asked this question to the participants, "If I have a hereditary disease, I do not refuse to marry a person who is a carrier for the same genetic disease" Majority of the participants (21.5% and 28.7%) answered: strongly disagree and disagree respectively, whereas a few of them (10.1% and 11.5%) answered: strongly agree and agree. Previous studies in AL Madinah [13], Oman [17], and Abha [18] have shown close results for those who want to proceed with the marriage.

Finally, to assess the community's acceptance of this examination, we asked them if they support PMSGC. It became clear to us that most of them (96.10%) accept premarital screening tests, and this is a good indication of how well our society is aware of its importance, and that their rate of rejection as it was in its beginnings has decreased a lot at this time. One of the limitations of this study was lack of understanding in participants with regards to some of the questions, due to poor knowledge about the program, and their answers were affected.

CONCLUSION

This study highlights that knowledge of the general population in the Al Riyadh area regarding the PMSGC program was good, while they have a moderate awareness regarding the program. These results indicate that there is a need for more information and education regarding the PMSGC program. However, there was generally a positive attitude toward the importance of the program and most of them strongly accept and support the PMS program in

Saudi Arabia. This positive attitude and acceptance provide strength for the success of the program.

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