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Public awareness and attitude toward premarital screening program in Jazan region, Saudi Arabia, an endemic area for hemoglobinopathies: A cross-sectional study

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Abstract

Hemoglobinopathies are highly prevalent in Saudi Arabia, with varying incidence rates across different regions. The Eastern and Jazan regions have the highest incidence rates. To prevent hemoglobinopathies, the premarital screening program (PMS) has been established in Saudi Arabia to identify at-risk couples before marriage. This cross-sectional descriptive study aimed to evaluate the awareness and attitude of young adults towards PMS in Jazan, Saudi Arabia, which involved 875 individuals (560 men and 315 women). The current study report significant association between sex, personal and family history of disease, and attitude towards PMS among young adults ($P < 0.05$). The study concludes that while there is a substantial level of awareness and positive attitude towards PMS among the population, there is a need for more detailed health campaigns led by healthcare providers, rulers, and Islamic leaders to highlight the importance of PMS as a preventative measure to reduce the incidence of hemoglobinopathies in Jazan, Saudi Arabia. *(Afr J Reprod Health 2023; 27 [8]: 65-75).*

Keywords: Hemoglobinopathies, premarital screening program, awareness; attitude, Jazan region, Saudi Arabia

Résumé

Les hémoglobinopathies sont très répandues en Arabie saoudite, avec des taux d'incidence variables selon les régions. Les régions de l'Est et de Jazan ont les taux d'incidence les plus élevés. Pour prévenir les hémoglobinopathies, le programme de dépistage prénuptial (PMS) a été mis en place en Arabie saoudite pour identifier les couples à risque avant le mariage. Cette étude descriptive transversale visait à évaluer la sensibilisation et l'attitude des jeunes adultes envers le SPM à Jazan, en Arabie Saoudite, qui a impliqué 875 individus (560 hommes et 315 femmes). La présente étude rapporte une association significative entre le sexe, les antécédents personnels et familiaux de maladie et l'attitude envers le SPM chez les jeunes adultes ($P < 0,05$). L'étude conclut que bien qu'il existe un niveau substantiel de sensibilisation et d'attitude positive envers le SPM parmi la population, il est nécessaire de mener des campagnes de santé plus détaillées menées par les prestataires de soins de santé, les dirigeants et les dirigeants islamiques pour souligner l'importance du SPM en tant que mesure préventive. réduire l'incidence des hémoglobinopathies en Jazan, Arabie saoudite. *(Afr J Reprod Health 2023; 27 [8]: 65-75).*

Mots-clés: Hémoglobinopathies, programme de dépistage prenuptial, conscience; attitude, région de Jazan, Arabie Saoudite

Introduction

Hemoglobinopathies, including sickle cell anemia (SCA) and thalassemia, are highly prevalent and affect 5% of the global population, with approximately 300,000 infants born with these disorders annually[1,2]. These conditions are particularly prevalent in sub-Saharan Africa, Asia, Mediterranean countries, and the Middle East, including Saudi Arabia, imposing a major health and economic burden on these regions and a physiological burden on affected patients and their families[1,2]. In Saudi Arabia, the incidence of hemoglobinopathies, including SCA and thalassemia, is among the highest in the Middle East[3]. The incidence varies across regions, with the highest rates observed in the Eastern and Jazan regions[3–5]. A report from a single premarital screening (PMS) center in Jazan for 2018 indicated that 25.8% (1025 out of 3970) of the individuals screened for hemoglobinopathies were affected[4]. Furthermore, the carrier rates of the sickle cell gene are high in Saudi Arabia, ranging from 2% to 27%[4–6]. Additionally, the high rate of consanguineous marriage in Saudi Arabia increases the likelihood of genetic disorders like hemoglobinopathies[7–11].

In 2004, the Saudi government introduced the PMS program as a preventative measure against hemoglobinopathies. The program involves testing couples before marriage to identify those at risk of developing hemoglobinopathies and having infectious agents including the human immunodeficiency virus (HIV), hepatitis B (HBV) virus, and hepatitis C virus (HCV). In addition, genetic counselling and couple education are another part of the PMS. Since its implementation, more than 1.5 million couples have undergone PMS in Saudi Arabia[12]. Although PMS has been effective in reducing the incidence of hemoglobinopathies in the country[13], a recent nationwide study involving 6,263 adults participants from 20 regions showed significant gaps in the knowledge regarding PMS[14]. Furthermore, some identified couples at risk ignored the results of PMS and proceeded with marriage despite the findings[13,15]. A study by Memish *et al* (2011) found that 73% (3,945 out of 5,370 individuals) of couples at risk ignored the advice given during PMS and proceeded with marriage[13], while even higher figures of 89%[16] and 98%[15] were reported by Alhamdan *et al* (2007) and Al Sulaiman *et al* (2010), respectively. These findings raise the question of whether young adults in Saudi society are aware of the benefits of PMS in reducing hemoglobinopathies.

Despite numerous large-scale studies conducted in Saudi Arabia, conflicting findings exist regarding the knowledge, awareness, attitudes, beliefs, and misconceptions about PMS[14,17–20]. However, to the best of the author's knowledge, only a few studies have been conducted in the Jazan region[21–23]. Health education is recommended as the primary preventative measure for controlling the incidence of hereditary genetic disorders, including hemoglobinopathies[24]. The study hypothesis awareness and attitude toward PMS at Jazan region is poor. Thus, the aim of this study is to evaluate the attitude towards and awareness of PMS in the Jazan region.

Methods

Study design

This cross-sectional study was conducted in the Jazan region, southwestern Saudi Arabia, from May 2022 to July 2022. The study questions were closed-ended and adopted from a previous study[25], which was a web-based questionnaire. A pilot study was conducted on 30 young adults to test the consistency of the study's questions with the hypothesis. Additionally, the questionnaire was validated by a consultant hematologist and a statistician. The validated and pre-tested questionnaire was randomly distributed among male and female adult students at Jazan University and the residents of Gizan city, Jazan region, Saudi Arabia. The responses were[2] kept anonymous and confidential and transferred to an Excel spreadsheet. The questionnaire consisted of three parts: part one gathered sociodemographic data, including gender, nationality, age, education level, marital status, occupational status, field of work, monthly income, area of residence, number of family members, consanguinity, and personal and family history of inherited blood diseases; part two assessed general knowledge and awareness of PMS; and part three evaluated attitudes towards PMS.

Ethical consideration

The study was approved by the Standing Committee for Scientific Research Ethics, Jazan University (number REC-43/05/098). The participants were informed about the study's aim and questions at the beginning of the questionnaire.

Statistical analysis

The responses of the participants were collected and analyzed with the Statistical Package for the Social Sciences, version 22.0, software (SPSS Inc., IBM, Chicago, Illinois, USA). Data are presented as frequencies and percentages for the qualitative variables. A chi-square test was carried out to evaluate the association among qualitative variables. $P<0.05$ was considered statistically significant.

Results

Socio-demographic characteristics

A total of 875 adult participants (560 men and 315 women) completed the questionnaire. The socio-demographic data of the participants were classified according to sex (Table 1), and there was a significant difference between male and female

Table 1: Demographic characteristics of the study participants (n=875)

Characteristics	Total n=875 (100%)	Male n=560 (64%)	Female n=315 (36%)	P value
Age (years)				0.04
18-22	434 (49.6%)	259 (46.3%)	175 (55.6%)	
22-30	322 (36.8%)	224 (40%)	98 (31.1%)	
31-40	63 (7.2%)	42 (7.5%)	21 (6.7%)	
41-50	42 (4.8%)	21 (3.8%)	21 (6.7%)	
>50	14 (1.6%)	14 (2.5%)	0	
Marital status				0.0001
Single	714 (81.6%)	490 (87.5%)	224 (71.1%)	
Married	147 (16.8%)	63 (11.2%)	84 (26.7%)	
Divorced/widow	14 (1.6%)	7 (1.2%)	7 (2.2%)	
Certificate of educational				0.0001
Secondary	98 (11.2%)	70 (12.5%)	28 (8.9%)	
Diploma	49 (5.6%)	28 (5%)	21 (6.7%)	
Bachelor	665 (76%)	399 (72.2%)	266 (84.4%)	
Postgraduate	63 (7.2%)	63 (11.2%)	0	
Employment				0.0001
Student	546 (62.4%)	308 (55%)	238 (75.6%)	
Employed	210 (24%)	175 (31.2%)	35 (11.1%)	
Unemployed	119 (13.6%)	77 (13.7%)	42 (13.3%)	
Field of study				0.0002
Health & Medical	581 (66.4%)	399 (72.2%)	182 (57.8%)	
Science & Engineering	154 (17.6%)	84 (15%)	70 (22.2%)	
Religious & Humanities	140 (16%)	77 (13.7%)	63 (20%)	
Monthly income (SAR)				0.0306
<5000	623 (71.2%)	399 (72.2%)	224 (71.1%)	
5000-10000	147 (16.8%)	84 (15%)	63 (20%)	
10000-15000	21 (2.4%)	21 (2.7%)	0	
>15000	84 (9.6%)	56 (10%)	28 (8.9)	
Family members				0.0004
1-3	133 (15.2%)	105 (18.7%)	28 (8.9%)	
4-6	217 (24.8%)	133 (23.7)	84 (26.7%)	
>7	525 (60%)	322 (57.5%)	203 (64.4%)	
Place of living				0.00047
City	504 (57.6%)	294 (52.5%)	210 (66.7%	
Village	371 (42.4%)	266 (47.5%)	105 (33.3%)	
Residence of Jazan region				1
Yes	700 (80%)	448 (80%)	252 (80%)	
No	175 (20%)	112 (20%)	63 (20%)	

participants (P<0.05) in all items of the socio-demographic data except their area of residence (P>0.05). The majority of the participants were young adults below the age of 30 (86.4%), unmarried and single (81.6%), and students (62.4%; Table 1). Among the study participants, men were higher in number (64%) than women (36%). The level of education showed that 76% of the participants had a bachelor's degree, 399 of them being men and 266 women, and 7.2% had a postgraduate degree, most of them being in the health and medical field (66.4%). The majority (62.4%) of the participants were students (308 men and 238 women), and 13.6% were unemployed. However, out of the 875 participants, 623 had a monthly income of less than 5000 Saudi Riyals (SAR). Surprisingly, 60% of the responses indicated that there were more than 7 members in their families. The study participants were from the Jazan region (80%), and 20% lived outside the region (Table 1).

Health and general characteristics of the study participants

From the study participants, 11.2% had a personal history of hereditary diseases (15% me vs 4.4%

Table 2: Health and general characteristic of the study participants

Health and General characteristics	Total n=875 (100%)	Male n=560 (64%)	Female n=315 (36%)	P value
Personal history of hereditary disease				0.0001
Yes	98 (11.2%)	84 (15%)	14 (4.4%)	
No	644 (73.6%)	339 (71.3%)	245 (77.8%)	
I do not know	133 (15.2%)	77 (13.8%)	56 (17.8%)	
Family history of hereditary disease				0.104
Yes	90 (10.3%)	56 (10%)	34 (10.8%)	
No	680 (77.7%)	427 (76.3%)	253 (80.3%)	
I do not know	105 (12%)	77 (13.8%)	28 (8.9%)	
Consanguineous relationship between parents				0.0001
Yes	441 (50%)	322 (57.5%)	119 (37.8%)	
No	399 (45.6%)	210 (37.5%)	189 (60%)	
I do not know	35 (4%)	28 (5%)	7 (2.2%)	
Type of relationship between parents				0.0001
First-degree	238 (27.3%)	175 (31.3%)	63 (20%)	
Second-degree	77 (8.8%)	49 (8.8%)	28 (8.9%)	
Distant	189 (21.6%)	140 (25%)	49 (15.6%)	
No familial relationship	371 (42.4%)	196 (35%)	175 (55.6%)	
Type of relationship between you and your partners				0.7713
First-degree	42 (22.2%)	14 (14.3%)	28 (30.8%)	
Second-degree	21 (11.1%)	21 (21.4%)	0 (0%)	
Distant	14 (7.4%)	7 (7.1%)	7 (7.7%)	
No familial relationship	112 (59.3%)	56 (57.1%)	56 (61.5%)	

Table 3: Knowledge of the study participants toward premarital screening program

Knowledge item	Total n=875 (100%)	Male n=560 (64%)	Female n=315 (36%)	P value
Is PMS program available in Saudi Arabia				0.0001
Yes	805 (92%)	497 (88.8%)	308 (97.8%)	
No§	14 (1.6%)	14 (2.5%)	0 (0%)	
I do not know	56 (6.4%)	49 (8.8%)	7 (2.2%)	
PMS is compulsory				0.0001
Yes	749 (85.6%)	455 (81.3%)	294 (93.3%)	
No§	35 (4%)	35 (6.3%)	0 (0%)	
I do not know	91 (10.4%)	70 (12.5%)	21 (6.7%)	
Who should be screened				0.629
Male	0 (0%)	0 (0%)	0 (0%)	
Female	14 (1.6%)	14 (2.5%)	0 (0%)	
Both	861 (98.4%)	546 (97%)	315 (100%)	
Components of PMS				0.0001
Blood analysis	413 (47.2%)	245 (43.8%)	168 (53.3%)	
Physical examination only	0 (0%)	0 (0%)	0 (0%)	
Both (blood & physical analysis)	378 (43.21%)	273 (48.8%)	105 (33.3%)	
I do not know	84 (9.6%)	42 (7.5%)	42 (13.3%)	
Disorders targeted by PMS				0.0044
Genetic disorders	126 (14.4%)	70 (12.5%)	56 (17.8%)	
Sexually transmitted diseases	14 1.6(%)	14 (2.5%)	0	
Both	700 (80%)	462 (82.5%)	238 (75.6%)	
I do not know	35 (4%)	14 (2.5%)	21 (6.7%)	
Source of information				0.0001
Family & friend	455 (52%)	280 (50%)	175 (55.6%)	
New paper and media	63 (7.2%)	42 (7.5%)	21 (6.7%)	
social media	161 (18.4%)	91 (16.3%)	70 (22.2%)	
School/University curriculum	91 (10.4)	56 (10%)	35 (11.1%)	
Medical service	105 (12)	91 (16.3%)	14 (4.4%)	

women; P<0.05), and 10.3% had a family history of hereditary diseases (10% men vs 10.8% women; P>0.05; Table 2). Half of the participants (50%; 441 responses, with 57.5% men vs 37.8% women) indicated a consanguineous relationship between their parents (parents were related before their marriage; P<0.05), with 27.3% indicating a first-degree relationship between parents (P<0.05) and 21.6% indicating that their parents were distant relatives (P<0.05).

Knowledge of the study participants toward PMS and genetic counselling program

The majority (92%) of the study participants were aware of PMS, with female participants (97.8%) showing more awareness of the existence of PMS than male participants (88.8%; P<0.0001; Table 3). Additionally, an overall 85.6% of the study participants indicated that PMS is compulsory in Saudi Arabia, with women being more aware than men. All women (100%) and 97% of the men indicated that both partners should be screened. In total, 47.2% of the responses showed blood analysis as the main component of PMS, with the target being genetic disorders and sexually transmitted diseases (80%). The main source of information was family and friends (total 52%: 50% men vs 55.6% women), followed by social media (total 18.4%: 16.3% men vs 22.2% women). School, medical services, newspaper, and media were the least used sources of information in general.

Attitudes of study participants toward PMS

Almost all the study participants (99.2%) agreed that PMS is important (Table 4). Moreover, 100% of the women found PMS important, but only 84.4% agreed to undergo the screening. Similarly, 98.8% of the men indicated the importance of PMS, but 92.5% agreed to undergo the screening (P<0.05).

The reasons for agreeing to undergo PMS were to prevent transmission of diseases to the offspring (overall 85.6%: 87.5% men vs 82.2% women; P>0.05), to ensure that the partner is healthy (overall 85.6%: 90% men vs 77.8% women; P<0.05), to prevent transmission of diseases (81.6%; P<0.05), and to ensure fitness for marriage (74.4%; P>0.05). In total, 95% respondents indicated not to undergo PMS. Of the total study participants, 7.4% were afraid that the test results would not be in favor of marital choices, with significant differences between male and female responses (P<0.05). The refusal of the continuation of the marriage by their prospective partner or their family was mentioned as one of the reasons by 5.1% of the participants, with significant differences between male and female responses (P<0.05). Approximately, 3.3% chose that they do not want to interfere with God's will (P<0.05). Few responses mentioned that PMS can lead to social stigma and were afraid that positive results would prevent continuation of marriage and would affect them (P>0.5; Table 3).

Out of the 875 participants, 826 (94.4%) believed that the most appropriate time for PMS is before marriage, with a higher percentage of woman agreeing than men (97.8% women vs 94.4% men; P<0.05). Only 3.8% and 0.8% of respondents selected "during high school" and "at birth," respectively, as the most appropriate time for PMS (P<0.05; Table 4).

Of the responses, 60.8% would cancel their marriage if they were told that their children would be affected (P<0.005), with a higher percentage of women agreeing with this than men (68.9% women vs 56.3% men). Only 8.8% of the men would proceed with the marriage because of their beliefs, while 24.8% would take time to assess the probability of getting the disease, and 8.8% do not know what to do (Table 4). Regarding the participants' attitudes towards law enforcement to stop marriage, 63.2% showed overall agreement, 22.4% disagreed, and 14.4% were neutral. There were highly significant differences between male and female responses (P<0.05; Table 4).

The association between sex, personal and family history of disease, and attitude towards PMS was found to be significant (Table 5), while no association was observed between consanguinity among parents and the participants' attitude towards PMS.

Discussion

This study examined the knowledge, awareness, and attitudes of young adults in Jazan region, Saudi Arabia towards PMS and found that, overall, participants had a high level of understanding about the program with significant differences between male and female participants. PMS was

Table 4: Attitudes of study participants towards premarital screening program

Attitudes item	Total n=875 (100%)	Male n=560 (64%)	Female n=315 (36%)	P value
Is PMS important				0.0463
Yes	868 (99.2%)	553 (98.8%)	315 (100%)	
No§	0 (0)	0 (0)	0 (0)	
I do not know	7 (0.8%)	7 (1.3%)	0 (0 %)	
Would you agree to undergo PMS?				0.0001
Yes	784 (89.6%)	518 (92.5%)	266 (84.4%)	
No	91 (10.4%)	42 (7.5%)	49 (15.6%)	
I do not know*	0 (0%)	0 (0%)	0 (0%)	
Reasons for agreeing to undergo PMS *				
To prevent transmission of diseases to my offspring				0.0749
Yes	749 (85.6%)	490 (87.5%)	259 (82.2%)	
No	35 (4%)	28 (5%)	7 (2.2%)	
To ensure that my partner is healthy				0.0008
Yes	749 (85.6%)	504 (90%)	245 (77.8%)	
No	35 (4%)	14 (2.5%)	21 (6.7%)	
To prevent transmission of diseases to me				0.009
Yes	714 (81.6%)	462 (82.5%)	252 (80%)	
No	70 (8%)	56 (10%)	14 (4.4%)	
To ensure fitness for marriage				0.529
Yes	651 (74.4%)	427 (76.3%)	224 (71.1%)	
No	133 (15.2%)	91 (16.3%)	42 (13.3%)	
Reasons for disagreeing to undergo PMS£				
I don't want to interfere with God's will				0.0349
Yes	29 (3.3%)	5 (0.9%)	9 (2.6%)	
No	62 (7.1%)	35 (6.3%)	39 (12.4%)	
Afraid that the test results will not be in favour of my marital choices				0.0001
Yes	65 (7.4%)	29 (5.2%)	12 (3.8%)	
No	26 (3.0%)	8 (1.4%)	34 (10.8%)	
Leads to social stigma				0.9758
Yes	18 (2.1%)	8 (1.4%)	9 (2.6%)	
No	73 (8.3%)	31 (5.5%)	33 (10.5%)	
Family will refuse continuation of marriage				0.0001
Yes	45 (5.1%)	11 (2.0%)	40 (12.7%)	
No	46 (5.3%)	29 (5.2%)	8 (2.5%)	
Afraid that the positive results will prevent continuation of marriage				0.8116
Yes	29 (3.3%)	15 (2.7%)	17 (5.4%)	
No	62 (7.1%)	27 (4.8%)	29 (9.2%)	
Such test results are an insult to me				0.8496
Yes	9 (1.0%)	5 (0.9%)	4 (1.3%)	
No	82 (9.4%)	34 (6.1%)	39 (12.4%)	
Most appropriate timing of PMS				
At birth§	7 (0.8%)	7 (0.8%)	0 (0%)	
During high school	42 (4.8%)	35 (6.3%)	7 (2.2%)	0.0011
Before marriage	826 (94.4%)	518 (92.5%)	308 (97.8%)	
Response to PMS if you were told that your children could be affected				
Cancel/discontinue the engagement	532 (60.8%)	315 (56.3%)	217 (68.9%)	
Continue with engagement and marriage because I believe in God§	49 (5.6%)	49 (8.8%)	0 (0%)	0.0003
Decision will depend on the probability of getting the disease	217 (24.8%)	147 (26.3%)	70 (22.2%)	
I wouldn't know what to do	77 (8.8%)	49 (8.8%)	28 (8.9%)	
Level of agreement with making PMS mandatory				

Agree	763 (87.2%)	476 (85%)	287 (91.1%)	
Disagree§	70 (8%)	70 (12.5%)	0 (0%)	0.0093
Neutral	42 (4.8%)	14 (2.5%)	28 (8.9%)	
Level of agreement with Law to stop marriage				
Agree	553 (63.2%)	308 (55%)	245 (77.8%)	
Disagree	196 (22.4%)	182 (32%)	14 (4.4%)	0.0001
Neutral	126 (14.4%)	70 (12.5%)	56 (17.8%)	

£ Percentages do not add up to 100% as participants could choose multiple responses.
*Row frequencies are added to the above row frequencies. §Row frequencies are added with the below row frequencies

Table 5: Classification of the study participants' attitudes towards premarital screening based on demographic characteristics

Variable		Agreed that carrying out PMS is important		Agreed with making PMS mandatory		Agreed with putting laws and regulations in place to stop marriage in case of positive PMS results	
		n	P value	n	P value		P value
Gender	Male	553	0.0001	476	0.0001	308	0.0074
	Female	315		287		245	
Consanguineous parents	Yes	448	0.3419	385	0.0680	273	0.7659
	No	420		336		280	
Personal history of hereditary disease	Yes	98	0.0001	84	0.0001	49	0.0001
	No	770		665		504	
Family history of hereditary disease	Yes	224	0.0001	182	0.0007	140	0.0001
	No	644		567		413	

established in Saudi Arabia 19 years ago to reduce the incidence of hemoglobinopathies[13]. Although PMS has been effective, achieving the elimination of hemoglobinopathies requires more than just a screening program; it also requires community and public awareness[24,26]. Previous studies have reported conflicting data regarding the knowledge, awareness, attitudes, beliefs, and misconceptions about PMS in different regions of Saudi Arabia[14,17–19,27–30].

This study found that, overall, participants had excellent knowledge and awareness about PMS, which was better compared to the reports from other local, Gulf, and Middle Eastern studies[14,17–20,25,27,28,30–32]. This could be attributed to the high incidence of hemoglobinopathies in the region and the age, educational levels, and field of study of the participants in this study. Although most of the participants had an excellent knowledge (overall >92% in all aspects, including the availability of PMS and who should be screened; >80% about the disorders targeted by PMS) and awareness (overall >88% in all aspects, including the importance of and willingness to undergo PMS) of the program, 50% showed a lack of knowledge about the components of PMS, which was similar to other study results[14,29,33,35]. it is worth noting that around 43% of the participants indicated that PMS is a combination of blood analysis and physical examination, with 0% selecting physical examination alone. The study participants indicated that PMS has blood and physical examination, which is not correct. The Nonetheless, these findings are considered as good knowledge compared to the reported percentage from other studies, which found that participants had poor to fair awareness of PMS components in Saudi Arabia and Oman[14,29,33,35].

In addition, 80% of the study participants indicated that PMS tests both inherited disorders and sexually transmitted diseases, which was a better responses (percentage) than those of other studies conducted in Saudi Arabia and Gulf countries[25,29,31,34]. The cognizance of the participants in this study could be attributed to two main reasons: the location being Saudi Arabia, particularly the Jazan region, or the field of study and age of the study participants. This fair level of knowledge about the components of PMS might be linked to the source of information, as 52% of the

study participants identified family and friends as the main source of information, and 10.4% and 12% selected school and medical services, respectively. This finding was similar to previous studies conducted in Jazan[22] and other regions of Saudi Arabia[14,19,29], according to which family and friends were the main sources of information regarding PMS. This consistency in the findings could be attributed to the high prevalence of hemoglobinopathies in Saudi Arabia and the burden on families. Therefore, educational programs on PMS and the tests targeted by PMS should be included clearly in curricula or public and undergraduate activities to ensure the success of PMS and other health programs[29].

The majority of the study participants were below 30 years of age and unmarried, which could explain their fair knowledge about PMS. High school students in Oman showed poor knowledge about the components of the screening program[25], which could be attributed to the rate of incidence of hemoglobinopathies in Jazan region. In addition, this finding highlights the importance of the source of information, suggesting that medical services and school should make more effort to educate society about the burdens of hemoglobinopathies and how PMS is an effective tool to identify couples at risk of these diseases[25].

When compared with a previous study conducted in Saudi Arabia in 2000, this study found that a higher percentage of men (98.8%) and women (100%) consider PMS as important approach[29,34]. Those who favored undergoing premarital screening did so for various reasons, including preventing disease transmission to their offspring (85.6%), ensuring their partner's health (85.6%), and preventing disease transmission to themselves (81.6%), with significant differences observed between male and female responses ($P<0.05$). This positive attitude towards PMS is considered good compared to what has been reported in other studies[25,31] and may be attributed to the age, education level, and field of the study of the participants. Indeed, education level is significantly associated with good knowledge of PMS[7], as shown by better knowledge scores observed in studies conducted in Saudi Arabia[14] and elsewhere[36]. The overall good to excellent knowledge and awareness observed in this study could be attributed to the educational background of the participants and the fact that the Jazan region is an endemic area for hemoglobinopathies.

This study presents inconsistent findings in comparison with previous studies conducted in Saudi Arabia. Specifically, young women showed excellent knowledge, awareness, and attitude towards PMS, which is in agreement with some reports[14,20,37] but contradicts others that found inadequate knowledge and awareness among women[14,19,20,28]. This observation has also been reported in Yemen, where women demonstrated significantly better knowledge regarding hemoglobinopathies than men[38].

The results of the study indicated a significant level of understanding among the participants, with 60.8% reporting that they would cancel the engagement and not proceed with the wedding plan if they found out that they were carriers of certain genetic diseases, which is consistent with previous reports[20,27]. However, in the Hail region, only 29.5% of young adults reported that they would cancel their engagement in similar circumstances[29]. Additionally, this study found that 5.6% of the participants would continue with their engagement and marriage despite the risk of passing on genetic diseases. This is in contrast with a previous report by Al Sulaiman *et al*[15], which indicated that 33% of the participants continued with their engagement and marriage despite being identified as carriers. Furthermore, some previous reports have indicated that couples at risk have the freedom to make their own decisions about whether to proceed with the marriage or not[20]. It is important to continue to follow these trends to observe their impact over time.

In the current study, 10.4% of the participants were not willing to undergo PMS mainly because they feared that the test results would not be favorable to their marital choices (65 out of 91, representing 7.4%). Other reasons for not wanting to undergo PMS included fears that the positive results would prevent the continuation of marriage (3.3%), interfering with God's will (3.3%), and concerns about social stigma (2.1%). Moreover, 60.8% of the participants reported that they would cancel the marriage, if they were informed that their offspring could be affected by genetic diseases, while only 5.6% would continue with the engagement and marriage because of their beliefs. In another study, one-third of the

participants (564 out of 1541) reported that they would continue with the engagement and marriage because of their beliefs[25]. A study conducted in Hail among young adults aged between 18 to 30 years found that 14.4% did not consider PMS to be important because it interfered with Islamic principles and God's will[29]. Therefore, it is recommended that intervention from Islamic scholars should be included in PMS educational programs[21,29]. This observation has also been reported previously with a higher percentage in Oman[25]. Furthermore, it has been reported that demographic characteristics do not influence marriage plans (for example calling off the wedding), while cultural factors do influence this decision in the Jazan region[21]. It is believed that calling off a wedding might cause family conflict[15,39], especially in consanguineous marriages[21,39], which are common in the region[8–11]. However, it should be noted that the main reasons for cancelling or proceeding with a marriage are not well reported, and some of the data are not publicly available[21].

The prevalence of consanguineous marriage in Saudi Arabia varies between 20–60%[7] and has been reported to exceed 51% in some regions[8–11], including the Jazan region[9]. In addition, this study reveals a high rate, reaching 50%, of consanguineous marriage among the parents of the study participants, with first-degree cousin marriage accounting for 27.3%. These findings are consistent with a recent study conducted in the Jazan region, which aimed to investigate factors associated with ignoring PMS results among identified at-risk couples who proceeded with marriage despite their PMS results[21]. These rates are also higher than those reported among highly educated individuals in Riyadh city (39.8%)[10] and the consanguinity rate among parents of unmarried female students in Jeddah[20] but lower than the rates reported in the Hail region[29].

Furthermore, this study found that the overall attitude toward PMS among male (88.8%) and female (97.8%) participants was excellent, indicating the importance of PMS and its potential for mandatory screening This finding is consistent with previous reports[15,20,23,27], and the percentage is higher than those reported in Abha city in Asir, a nearby region[30]. However, despite this substantial level of awareness and positive attitude toward PMS, around 37% of the participants showed either disagreement or neutrality towards law regulation to stop marriages, with a higher percentage being male participants (45%) as compared with female participants (22%; $P<0.0001$). Moreover, 94.4% of the participants believed that the best time for PMS is before marriage, which is a higher percentage than that reported among university students in Jeddah, which included 1563 students aged less than 25 years old[20].

This study has some limitations and strengths similar to other studies, including the small sample size, lack of identification of the area within the Jazan region from which the study participants were recruited, and the exclusion of older people. However, the sample size in this study is bigger than that of other local studies[21,29].

Conclusion

This study found that study participants in the Jazan region exhibited good to excellent knowledge and awareness toward PMS but demonstrated poor understanding of the exact components of the screening. Additionally, despite their positive attitude toward PMS, the study revealed that some female participants had reservations about undergoing PMS. These results highlight the need for well-planned and in-depth professional awareness programs focused on PMS in the Jazan region, particularly among young adults. Furthermore, implementing awareness programs in secondary schools could be highly beneficial in establishing a more solid foundation of community awareness, given the high incidence rate of hemoglobinopathies and the excellent awareness among young adults.

Conflict of interest

The authors declare no conflict of interest.

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