

Original Article

Public knowledge, perceptions, and attitudes towards HIV/AIDS in Bahrain: A cross-sectional studyEssam M Janahi¹, Sakina Mustafa¹, Sajeda Alsari¹, Mariam Al-Mannai², Ghada N Farhat³¹ Department of Biology, College of Science, University of Bahrain, Sakhir, Kingdom of Bahrain² Department of Mathematics, College of Science, University of Bahrain, Sakhir, Kingdom of Bahrain³ Hubert Department of Global Health, Rollins School of Public Health, Emory University, GA 30322, United States**Abstract**

Introduction: HIV/AIDS is one of the major health problems worldwide. Despite the low prevalence of HIV in Bahrain, educational and awareness programs remain highly important in controlling and preventing the spread of the disease. This study aimed to assess the public's knowledge, risk perceptions, and attitudes towards HIV/AIDS in Bahrain.

Methodology: A self-administered questionnaire-based survey was administered to and completed by 1,038 Bahraini adults.

Results: Although the average general awareness among participants was good (63%), some misconceptions and erroneous beliefs were common, including knowledge of mode of transmission and high risk groups. Participants' attitudes towards HIV/AIDS patients varied but were mostly negative; 60% of respondents agreed to isolating HIV/AIDS patients in workplaces and schools, and 52.4% of them thought that HIV is a divine punishment. The vast majority of the participants (84.4%) believed in the role of religion in limiting the spread of the disease. Though the local media was the least utilized source of information, the general opinion of the participants about the role of Bahraini government agencies and organizations in combating HIV/AIDS was positive.

Conclusions: Though the Bahraini public had good knowledge about HIV/AIDS, there were misconceptions that need to be addressed. A major finding of this study was the negative attitudes towards HIV/AIDS patients. To have successful HIV control programs, negative attitudes towards HIV patients and the disease should be minimized. Existing and newly proposed health education and awareness program in Bahrain should address the issue of negative attitudes towards HIV/AIDS observed in this study.

Key words: HIV/AIDS; public knowledge; attitudes; stigmatization; Bahrain.

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Introduction

Human immunodeficiency virus (HIV) infection is one of the most serious epidemics that continues to grow around the world [1]. Today, acquired immunodeficiency syndrome (AIDS) is the fourth leading cause of death worldwide [2,3]. Since it was first discovered in the early 1980s, millions of new cases have been emerging and many of them are dying annually. There is, at present, no known curative treatment that eliminates the virus from infected individuals' bodies [1-3]; however, the available antiretroviral drugs play important role in lowering the rate of mortality and restricting the infection's progression [4].

There are three stages in the course of HIV infection: acute HIV infection, clinical latency, and AIDS. The virus attacks CD4 cells, causing their count to fall rapidly, which has severe effects on the immune system. During the clinical latency stage, the virus

continues to replicate at very low levels. At this stage, HIV patients experience no symptoms or only mild ones. The AIDS phase starts when the immune system is badly damaged and becomes vulnerable to opportunistic infections and cancers, including pneumonia, lymphoma, Kaposi's sarcoma, and AIDS dementia [1]. Sexual HIV transmission and drug-related transmissions are still considered to be the main modes of the virus transmission. Vertical HIV transmission is obviously reduced with the use of antiretroviral therapy in many developing countries [5]. Healthcare-associated HIV transmission is also one of the virus's modes of transmission. This includes unsafe injections, blood transfusion, and accidental healthcare procedures by health workers, mainly due to the improper awareness about the safe practices that prevent the spread of the virus, especially in the first decades of the epidemic in the developing countries, where the reuse of injection equipment and unsafe

handling of blood-contaminated items was common [3].

UNAIDS estimates that there are around 500,000 HIV-positive individuals in the Middle East and North Africa region and that the rate of new infections is steadily increasing in this region [5]. Despite the shortage of data on HIV, the epidemic has a very low prevalence in the Kingdom of Bahrain, ranging from less than 0.1% among low-risk groups, which include blood donors and antenatal care women, to 3.3%–4.6% among high-risk groups, which include drug users [5,6]. Since the discovery of the first case in Bahrain in 1986, a total of 2,046 cases have been reported, and those reported have been at late stages of infection. Most of the cases were among drug users, but recently the number of cases from heterosexual transmission has been increasing, indicating that the epidemic is spreading among the community [6].

HIV/AIDS education and awareness programs have become instrumental in controlling and preventing the spread of the disease [7,8]. In low-prevalence countries such as Bahrain, these kinds of awareness programs are also important to limit the excessive and nonfactual fears and concerns about the disease [9,10]. Successful disease control efforts depend on comprehending both the distribution and frequency of health behaviors and measuring the general public knowledge towards HIV/AIDS and the associations of their knowledge and attitudes with different socio-demographic factors [11-15]. Therefore, this study aimed to examine the knowledge of Bahraini people about the virus and the disease, their risk perceptions, their preventive behaviors and practices, and furthermore to determine the association of these factors with socio-demographic characteristics. In addition, this study examined the public opinion about the effectiveness of the current governmental and public efforts in controlling HIV/AIDS. Findings from this study would provide the knowledge base for informing current and new awareness programs for the control of HIV/AIDS.

Methodology

Study design and population

A cross-sectional survey utilizing a self-administered questionnaire was carried out from September 2014 to December 2014 in the Kingdom of Bahrain. The study population was Bahraini adults 18 years of age or older. No foreign populations were included in the study. A total of 1,630 participants were approached for study participation. The sample size (1,630 participants) was calculated based on Bahrain's 2010 census data [16], with a 95% confidence level and

$\pm 3\%$ sampling error. The total Bahraini population size is 568,399. A systematic proportional quota sampling was used to ensure that respondents were demographically representative of the general population, with quotas based on age, sex, and educational level. A hard copy of the questionnaire was distributed to people in public places such as malls, shopping centers, health centers, ministries, and companies in different regions of the Kingdom of Bahrain. The participants were informed about the purpose of the study and were given 30 minutes to complete the questionnaire. In addition, they were advised not to seek external help, in order to have a true picture of the degree of public awareness. A soft copy was also uploaded to Google documents and the link was sent to friends, colleagues, and family members in an email containing instructions to complete the questionnaire. Respondents were also encouraged to forward the email to reach as many as possible.

Data collection and questionnaire design

A 50-item questionnaire was designed and prepared by the authors, based on a review of the literature. Before administration, the questionnaire was piloted on a random sample of 50 participants to augment the internal validity of the study. Based on the pilot survey results, some questions were rephrased and modified. Internal consistency of the questionnaire was computed using Cronbach's alpha coefficient. Results ranged from 0.72 to 0.83 with an average of 0.78. The questionnaire was written in English and then was translated to Arabic, since most of the public would comprehend the Arabic version more easily. The questionnaire was divided into four sections. The first section involved the general socio-demographic characteristics of the participants. The second section included questions related to the public's knowledge about HIV/AIDS, including HIV/AIDS general knowledge, mode of transmission, symptoms, testing, people at higher risk, prevention, and treatment. In this section, participants indicated, on a three-point scale, the degree to which they were aware of HIV/AIDS information (3 = Yes, 2 = No, and 1 = I do not know). The third part of the questionnaire was about the public's attitudes towards HIV/AIDS in two categories: opinions, concerns, and perceptions regarding HIV/AIDS; and perceptions of the efforts of Bahraini government agencies and organizations regarding HIV/AIDS. The participants indicated their answers in this part on a five-point Likert scale (1 = I do not know, 2 = Strongly disagree, 3 = Disagree, 4 = Agree, and 5 = Strongly agree). The last section of the questionnaire

included questions regarding the participants' concern of getting HIV, their feelings towards HIV/AIDS patients, their major sources of information about HIV/AIDS, whether they had participated in or had heard about any awareness activities regarding HIV/AIDS, and if they wanted to know more about any topic related to HIV/AIDS.

Statistical analysis

After data entry and cleanup, data was analyzed using SPSS version 21. Exclusion criteria included questionnaires completed by non-Bahraini respondents, respondents who were younger than 18 years of age, and incomplete questionnaires (those with more than three unanswered questions). Descriptive statistics (N, % and mean \pm standard deviation [SD]) were calculated to assess the knowledge, attitudes, and practices of the sample. Associations of these factors with gender, age, marital status, educational level, and employment status were analyzed using student's *t*-test or analysis of variance (ANOVA) for continuous variables and the Chi-square test for categorical variables. Kruskal-Wallis and Mann-Whitney U tests were also used.

Ethical issues

This study was approved by the head of the biology department of the University of Bahrain and by a select ethical committee (May 2014). It conformed to the provisions of the Declaration of Helsinki in 1964 (and revised in Fortaleza, Brazil, October 2013). All

respondents signed the informed consent form before participation.

Results

Response rate

Of the 1,630 questionnaires distributed, 1,286 were returned (response rate = 78.9%), of which 1,038 were complete (complete response rate = 80.71%).

Participants' socio-demographic characteristics

The study population included 43% males and 57% females with a mean age of 31 years. In terms of education, 38.3% of participants had a bachelor's degree, 37.9% had school certificates, and a lower percentage had post-graduate education (Table 1). The religion of the majority of the participants was Islam (99.8%). There were no statistically significant differences between the study population and Bahrain's 2010 census data [16] in terms of age, gender, and educational level (data not shown).

Participants' general knowledge of HIV/AIDS

Most of the participants were aware of general information about HIV/AIDS; the average general awareness among participants was 63.03% (range 26.02%–96.44%). In general, employed participants between 51 and 60 years of age who had post-graduate education were significantly more aware of general information regarding HIV/AIDS ($p < 0.05$), and there

Table 1. Socio-demographic characteristics of the participants.

Variables	Frequency	Percentage (%)
Gender		
Male	446	43
Female	592	57
Age		
< 20	198	19.1
21–30	422	40.7
31–40	238	22.9
41–50	126	12.1
> 51	54	5.2
Marital status		
Single	465	44.8
Married	573	55.2
Educational level		
School level	393	37.9
Diploma	176	17
Bachelors	398	38.3
Post graduates	71	6.8
Employment status		
Employed	572	55.1
Unemployed	182	17.5
Students	284	27.4

was no significant difference between genders and on the basis of marital status (Table 2).

The majority of the participants knew the infectious nature of the disease (83.9%) and its mode of action in attacking the body's immune system (88.5%). However, a reasonable portion (42%) wrongly believed that AIDS could be hereditary, and many of them (41.5%) also underestimated the fatalities caused by AIDS since its discovery.

The transmission routes of HIV were recognized correctly by the majority of the participants. However, the prevalence of incorrect beliefs regarding the modes of transmission was significantly high: 77% believed the infection could be transmitted via coughing or sneezing of an infected individual, 46.4% via mosquito bites, 41.8% via sharing public toilets and swimming pools, 27.6% via sharing utensils and meals with infected person; in addition, 41% thought that sharing razors or toothbrushes with someone who has HIV could not transmit the disease. Most of the participants (75.8%) had two or more of these misconceptions. In addition, 36.9% of the participants had no idea if all body fluids transmit the virus equally. Another misconception found was about the window period of HIV infection; 59% of the participants were not aware of it, and 32% did not know that HIV-positive individuals do not necessarily have AIDS. The majority of the participants (66.6%) recognized the early

symptoms of HIV infection and knew that AIDS is the late stage of the infection (74.9%).

Of all participants, around 45.7% wrongly believed that people of all ages can be infected to the same degree. Although the majority of the participants correctly identified drug addicts (92.8%), homosexuals (92.8%), and infants whose mothers are infected (75.3%) among the people at higher risk of HIV infection, about 60.8% did not recognize healthcare workers among those at higher risk.

Regarding treatment and prevention, approximately half of the participants correctly recognized that currently there is no cure or vaccine against HIV (61.4% and 42.9%, respectively), and 53.9% of them recognized the role of antiretroviral therapy in providing longer and healthier lives for HIV patients. On the other hand, 70.2% of respondents did not know that antibiotics have no effect on HIV infection, and 64.7% had no idea about the role of antiretroviral treatment and giving birth by caesarean section in reducing vertical transmission.

Participants' attitudes, risk perceptions, and opinions about HIV/AIDS infection and patients

Participants' attitudes towards HIV/AIDS patients were mixed, but mostly negative. For example, 77.5% of the participants would not eat food prepared by an HIV-positive person, 53.5% would avoid shaking hands with them, and 54.8% would not sit near or hug them.

Table 2. Participants' general knowledge of HIV/AIDS by socio-demographic characteristics.

Variables	Mean*	SD	95% CI	P value
Gender				
Male	2.39	0.27	2.36–2.42	0.104
Female	2.36	0.23	2.34–2.38	
Age				
< 20	2.34	0.25	2.30–2.38	0.014
21–30	2.36	0.25	2.33–2.39	
31–40	2.39	0.26	2.36–2.43	
41–50	2.41	0.24	2.37–2.46	
> 51	2.44	0.04	2.35–2.53	
Marital status				
Single	2.36	0.26	2.34–2.39	0.168
Married	2.39	0.24	2.36–2.41	
Educational level				
School level	2.38	0.26	2.33–2.43	0.004
Diploma	2.35	0.24	2.31–2.38	
Bachelors	2.39	0.25	2.36–2.41	
Post graduates	2.51	0.18	2.43–2.59	
Employment status				
Employed	2.40	0.24	2.38–2.42	0.020
Unemployed	2.35	0.23	2.32–2.39	
Students	2.35	0.26	2.32–2.38	

*Data are expressed as weighted mean of the participants' answers.

Furthermore, 82.9% of the participants thought that HIV-positive patients should reveal their medical condition to their colleagues, and 60.1% went further to agree with isolating them in workplaces and schools. In addition, 52.4% of respondents thought that HIV is a divine punishment. Contrary to this negative attitude, 55.3% of the participants thought that HIV/AIDS patients deserve support and respect similar to that given to patients of other diseases, and 65.8% described their feelings towards HIV/AIDS patients as compassionate. Other feelings were also reported, such as hatred, apathy, fear, cautiousness, and sadness. In general, married participants with only school-level education showed more positive attitudes towards HIV/AIDS patients than did those of higher education levels and respondents who were single ($p < 0.05$). There was no statistically significant difference in terms of attitudes between genders and different age groups (Table 3).

With respect to participants' concerns and threat perceptions towards the HIV/AIDS epidemic, about 59.1% of the participants thought there would be a sharp increase in the number of HIV cases in Bahrain in the next 10 years and 80.2% of them thought that AIDS could become a threat to Bahraini society. Of all participants, 54.5% correctly identified the low prevalence of HIV in Bahrain and knew that half of cases occur among drugs users. Overall, most of the participants (77%) said that they had never been tested

for HIV, and more than half (68.6%) of them were not concerned about contracting HIV. Married, male, and employed participants 50 years of age and older reported a significantly higher concern of contracting HIV/AIDS compared to other groups (data not shown).

As all the participants of the study were Muslims, the vast majority (84.4%) believed that abiding by Islamic rules in avoiding homosexuality, intravenous drug use, and sexual intercourse outside marriage will limit the spread of the disease. About 49.9% of the participants were unsure about the role of male circumcision in reducing HIV transmission. Regarding religious beliefs, married, male, and employed participants between 41 and 50 years of age were stronger believers in the role of religious beliefs compared to other groups ($p < 0.05$), whereas no statistical difference in terms of educational level was found (Table 4).

Participants' attitudes about existing educational and awareness programs

About half of the participants (54%) thought positively about the performance of the Bahraini government agencies and organizations in terms of education and preventive measures. For instance, about 37%–44.1% of the participants thought positively about the performance of educational institutes and hospitals and health centers in educating the public about HIV/AIDS. However, 46.7% of them thought that

Table 3. Participants' attitudes and opinions regarding HIV patients.

Variables	Mean*	SD	95% CI	P value
Gender				
Male	3.76	0.54	3.71–3.82	0.470
Female	3.79	0.53	3.75–3.83	
Age				
< 20	3.76	0.59	3.68–3.85	0.609
21–30	3.75	0.54	3.70–3.81	
31–40	3.80	0.50	3.73–3.86	
41–50	3.80	0.47	3.72–3.89	
> 51	3.62	0.68	3.53–4.22	
Marital status				
Single	3.70	0.58	3.65–3.76	0.000
Married	3.84	0.49	3.80–3.88	
Educational level				
School level	3.88	0.59	3.77–4.00	0.012
Diploma	3.81	0.49	3.74–3.88	
Bachelors	3.72	0.51	3.67–3.77	
Post graduates	3.70	0.45	3.51–3.88	
Employment status				
Employed	3.80	0.52	3.75–3.84	0.103
Unemployed	3.81	0.46	3.75–3.88	
Students	3.72	0.60	3.65–3.79	

*Data are expressed as weighted mean of the participants' answers.

HIV/AIDS awareness-promoting campaigns are not enough. Overall, male participants over 51 years of age who were employed and married had significantly more positive perceptions about the performance of governmental and public organizations. There was no significant difference in terms of educational levels.

The local media (Bahrain TV and local newspapers) was the least utilized source of information by the participants; 6.8% and 11.8%, respectively, of respondents reported these as their main sources of information. The major sources of information for the participants were as follows: internet (43.3%), books (19%), and posters and brochures (18.9%); the respondents thought these sources were of high to intermediate accuracy. Overall, many participants reported that they had not heard about the many awareness activities in the country such as World AIDS Day, the slogan “Bahrain to be Free of AIDS”, about any activities of the National Committee of Bahrain Anti-AIDS, nor had they participated in any activities or workshops related to HIV/AIDS. Also, the participants indicated the areas where there is a shortage of information: available diagnostic tests of HIV/AIDS (39.4%), sites for testing (29.6%), updated status of HIV/AIDS in Bahrain (39.5%), more information about transmission of the disease (41.8%), and current treatments available in Bahrain (60.3%).

Discussion

Educational awareness programs about HIV/AIDS have been one of the key measures in controlling the epidemic, as they promote the adoption of healthy behavior in the general public [15,17,18]. The present study is the first study in the Kingdom of Bahrain to assess the knowledge and attitudes of the general Bahraini public towards HIV/AIDS, which may contribute positively to the refinement of the HIV containment and prevention plans and programs in Bahrain.

The present study revealed that a high proportion of the population has fairly good knowledge about HIV/AIDS; however, misconceptions were also common. Some of these misconceptions were related to the mode of transmission; for example, many participants thought that HIV can be transmitted via insect bites, coughing or sneezing, sharing public toilets and swimming pools, or sharing utensils and meals with infected persons. Similar findings were also found in studies conducted in Turkey, Yemen, Egypt, and Iran [13,19-23]. Despite knowing that HIV is a viral disease, about half of the participants had no knowledge of the antiretroviral treatment, and wrongly thought that antibiotics can be used for treating HIV. There was also confusion among participants between treating and curing the disease, as some thought that there is a cure for the disease and some believed that a vaccine against HIV is available. A study conducted in a neighboring

Table 4. Participants’ opinion on religious beliefs about HIV/AIDS.

Variables	Mean*	SD	95% CI	P value
Gender				
Male	4.00	0.91	3.91–4.08	0.000
Female	3.79	0.94	3.71–3.86	
Age				
< 20	3.75	0.98	3.61–3.89	0.001
21–30	3.78	0.95	3.69–3.88	
31–40	3.98	0.87	3.87–4.09	
41–50	4.10	0.87	3.94–4.25	
> 51	4.07	0.92	3.63–4.51	
Marital status				
Single	3.78	0.96	3.69–3.87	0.003
Married	3.95	0.90	3.88–4.03	
Educational level				
School level	3.97	0.93	3.80–4.13	0.114
Diploma	3.85	0.96	3.71–4.00	
Bachelors	3.88	0.90	3.80–3.97	
Post graduates	4.02	0.80	3.71–4.33	
Employment status				
Employed	3.94	0.89	3.87–4.01	0.027
Unemployed	3.86	0.96	3.72–4.00	
Students	3.76	1.00	3.64–3.87	

*Data are expressed as weighted mean of the participants’ answers.

country (Saudi Arabia) showed similar results, as half of the respondents did not know that there is no cure for HIV infection [24]. Another study in Egypt showed that 81.4% of the participants incorrectly believed that there is a cure for AIDS [20].

Several studies reported that people with more knowledge about the disease also show more positive attitudes towards patients [13,19,21] and vice versa [25]. Despite the fairly good knowledge background of the Bahraini general population, negative attitudes towards HIV/AIDS patients prevailed. Many participants who correctly identified that shaking hands, sharing utensils and meals, and coughing and sneezing do not transmit HIV showed negative attitudes towards HIV/AIDS patients by indicating they would avoid shaking hands, sharing meals, or sitting near them. In addition, more than three-quarters of the participants thought that HIV-positive patients should reveal their medical condition to their colleagues, and some went further to agree with isolating them from workplaces and schools. These results are consistent with results of other studies conducted in several countries [10,25,26]. Taher and Abdelhai reported, in their study, that 75.7% of the respondents would feel uncomfortable working with HIV/AIDS patients in the same office [20]. In contrast, a study conducted in Iran showed that 52.3% of the respondents agreed that HIV/AIDS patients should have equal rights to study and work [21]. In another study, 25% of respondents agreed that HIV/AIDS patients have the right to keep their diagnosis undisclosed [24].

A study showed that negative attitudes are generated by feelings of anger towards HIV/AIDS patients and difficulty to sympathize with them [19]. Contrary to those findings, our study showed that a high proportion of the participants who showed negative attitudes expressed their feelings of compassion towards HIV/AIDS patients. These findings suggest that the negative attitudes towards HIV/AIDS patients are not due to negative feelings towards them. It could be attributed to the fear of getting infected with HIV. The fear of contagion has been reported as a factor for negative attitudes, along with the lack of knowledge about the epidemic [25-27]. This feeling of fear was clearly evident from the participants' responses to other questions; many of them strongly agreed with having an HIV test as a part of the regular medical checkup, and many thought that AIDS could become a threat to Bahraini society in the near future. The compassionate feeling was also evident, as more than half of the respondents strongly agreed that HIV/AIDS patients

deserve support and respect similar to that given to patients who have other diseases.

More than half of the participants thought that HIV is a divine punishment. Similar results were found in other countries such as Turkey and Yemen [14,19]. However, Mwamwenda reported that similar studies from the United States, Kenya, South Africa, and Tanzania showed opposition to such an idea [28]. Generally, in countries where Islam is the official religion, people tend to believe that HIV is a punishment from God for people not complying with Islamic rules. They tend to link HIV major modes of transmission with behaviors that are forbidden in Islam such as intravenous drug use, homosexuality, and sexual relationships outside marriage [18,29]. Furthermore, the majority of the participants believed that commitment to Islamic rules will limit the spread of the disease. Hasanain suggested that culture and religion control various aspects in peoples' life, including attitudes towards HIV/AIDS [18]. Since Bahrain has a majority Muslim population (99.8%) [16], these findings were expected.

Whether the reason is, fear, lack of knowledge, or religious beliefs, negative attitudes towards HIV/AIDS patients can lead to stigmatization [25]. HIV/AIDS stigmatization is considered a major obstacle and important barrier to the successful prevention of the epidemic [19,25], and it should be eliminated or reduced for prevention programs to be effective [30]. Mahajan *et al.* suggested some methods to reduce HIV/AIDS-related stigma, including introduction of protective legislation on HIV/AIDS discrimination and developing information campaigns for stakeholders about the rights afforded by such legislation [31].

The major sources of information about HIV/AIDS for the Bahraini public were websites, followed by books and pamphlets. Very few participants selected the mass media (television, radio, and newspapers) as their major source of information, unlike many other studies, in which mass media were reported as being the major source of information [10,21]. This is a very important finding of this study, as it reveals a big gap in utilizing the mass media in providing the public with the necessary information about HIV/AIDS. One of the successful methods of delivering HIV/AIDS information is to integrate it into popular programs and dramas that are broadcasted during prime or peak times. In this way, education will be delivered in a more effective way, through entertainment. Since the use of the internet and its applications is very common in Bahrain, social media sites and mobile applications can be used to disseminate HIV/AIDS awareness among the

public through sites such as Twitter, Facebook, Pinterest, WhatsApp, and Youtube. In addition, our study showed that communication about HIV/AIDS among families and friends are very scarce, which is similar to the findings of other studies [21,26]. While mass media are important communication tools, their success is improved by interpersonal communication and dialogue; community outreach and social networks; and workplace, school, hospital, and health center awareness campaigns. Educational programs about HIV/AIDS should be intensified, and the existing ones should focus on the misconceptions among the general public. In addition, programs need to educate people how to link the knowledge they have with their attitudes and behaviors. This is very important to eliminate or reduce the negative attitudes observed in this study.

Conclusions

This study draws a general picture of the Bahraini population's knowledge and attitudes towards HIV/AIDS. Though the Bahraini public had a good knowledge background, there were many misconceptions that need to be addressed. However, the major finding of this study was the negative attitudes towards HIV/AIDS patients. The Bahraini authorities need to revise their health education and awareness campaign through the local mass media and the Ministry of Education, and find better methods to deliver the necessary information through websites, social media sites and mobile applications, information hotlines, pamphlets, and printed educational materials. Such programs should focus more on eliminating or reducing those negative attitudes, which is an important step in the control of HIV/AIDS.

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Authors' contributions

EMJ designed data collection tools, monitored data collection, wrote the statistical analysis plan, analyzed the data, and drafted and revised the paper. SM designed data collection tools, was involved in data entry, analyzed the data, and drafted the paper. SA was responsible for questionnaire distribution and was involved in data entry. MA was responsible for statistical analysis and revised the

paper. GNF revised and improved the draft manuscript. All authors read and approved the final manuscript.

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