Original Article

Knowledge and attitude towards hydrocephalus among healthcare providers and the general population in Saudi Arabia

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Abstract

Background: Hydrocephalus is a worldwide disorder characterized by abnormal flow or rarely excessive production of cerebrospinal fluid, leading to the widening of the cerebral ventricles system due to the accumulation of the cerebrospinal fluid in the brain. Previous researches have shown that knowledge about the disorder is limited among healthcare providers and the population, affecting attitudes toward patients, as well as patient outcomes. **Aim:** To investigate healthcare providers and population's knowledge and attitudes towards hydrocephalus in Saudi Arabia. **Methodology:** A descriptive cross-sectional study was conducted through an electronic questionnaire. The survey was self-constructed in Arabic and English by the research team and inspired by other awareness questionnaires and validated before use by three experts. **Results:** There were 444 participants in this study, aged between 17 and 73 years with a mean age of 32.60 ± 10.98. Most of the participants were from the general population (74.8%). More than half of the participants had a bachelor's degree (60.1%). 38.4% of healthcare providers had negative knowledge while 61.6% had positive knowledge. In addition, 82.5% of the general population had negative knowledge, although 17.5% had positive knowledge. Moreover, it was observed that 17.0% of the healthcare providers had a bad attitude while 83.0% had a good attitude. In addition, 60.2% of the general population had a bad attitude, whereas 39.8% had a good attitude. **Conclusion:** This study revealed that the level of knowledge and attitude towards hydrocephalus among healthcare providers was good on both aspects, while it was poor among the general population.

Keywords: Awareness, hydrocephalus, neurological disorders, neurosurgery

Introduction

Hydrocephalus is a common disease with prevalence of 1.1 per 1000 births worldwide, and 1.6 per 1000 births in Saudi Arabia.[1,2] Hydrocephalus is characterized by abnormal flow or, rarely, excessive production of cerebrospinal fluid (CSF), leading to the widening of the cerebral ventricles system due to the accumulation of the CSF in the brain. The choroid plexus produces most of the Cerebrospinal fluid in the ventricular system at 0.3-0.4 ml/min. The overall volume of CSF in adults is 90-150 ml.[3]

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The cerebrospinal fluid disturbance is a severe condition that affects brain function and may lead to death if not treated. There are several causes such as congenital malformations (e.g., aqueduct stenosis and benign intracranial cyst) and acquired causes (e.g., intraventricular tumor and meningitis).[3] Mainly affect children and the elderly above 65 years of age. Younger individuals present with different symptoms, so its prognosis is hard to predict.[4,5] There are different types of hydrocephalus, which include non-obstructive (communicating) hydrocephalus, and obstructive (non-communicating) hydrocephalus. Further, hydrocephalus can be classified as congenital, acquired, normal pressure hydrocephalus, or ex-vacuo hydrocephalus.[6]

Hydrocephalus symptoms vary with age. Infants usually experience unusual enlargement of the head circumference because the fontanels are still not closed; other symptoms at this stage include vomiting, sleepiness, irritability, and convulsions. Older children and adults have signs of increased intracranial pressure such as nausea, vomiting, visual abnormalities, and dizziness.[7] Normal pressure hydrocephalus affects the elderly and is characterized by gait abnormality, urinary disorders, such as incontinence, and dementia.[8]

Diagnosis of hydrocephalus is dependent on patient history, physical examination, and neurological assessment with imaging studies like magnetic resonance (MRI), or other CSF monitoring techniques.[9] Currently, hydrocephalus management involves a surgical intervention with shunt systems, or endoscopic ventriculostomy (ETV).[6,10] Shunting is associated with complications, such as infection, malfunction, or obstruction, in which case, a replacement may be needed.[10]

International studies have revealed a global lack of knowledge about hydrocephalus among the population. For example, a study was based in Turkey revealed that parents of children who required a shunt to treat their hydrocephalus did not have good knowledge with regards to the disorder or related therapeutic procedures.[11] In addition, a study from Tanzania showed that children affected by hydrocephalus experience social difficulties, which are related to low levels of hydrocephalus knowledge among the adults in their communities.[12]

In addition, a study in Uganda, which measured the level of knowledge and, awareness as well as attitudes towards hydrocephalus and spina bifida among the population showed that there is inadequate knowledge about both the diseases.[13] This study aimed to investigate knowledge and attitudes about hydrocephalus among healthcare providers and the population in Saudi Arabia. The secondary aim of the study was to define deficiencies and propose ways to decrease knowledge gaps where they exist.

Methodology

This analytic, cross-sectional study was conducted through an electronic questionnaire that assessed the level of knowledge and attitude towards hydrocephalus among healthcare providers and the general population in Saudi Arabia. The research ethics committee of King Abdul-Aziz University Hospital approved the study.[14,15] The survey was conducted and sent to healthcare providers as well as the general public between June and July of 2018 through online social media such as WhatsApp, Twitter, and Telegram. The sample was convenient and the study involved 444 participants of both genders. The first section of the questionnaire gathered socio-demographic data, which included: age, gender, marital status, educational level, the country, and city where the participant lives, occupation, and academic year for the healthcare providers. The second section was related to knowledge and attitudes about hydrocephalus. Scientifically correct answers for knowledge and attitude elements were given a score of 1 point; all points were added to create a final score. The score was then converted to a score percent by the division of the actual score by the highest score (11 points for knowledge elements and 6 points for attitude elements). The authors classified respondents as having poor attitude level when they scored 60% or less, and a good level for those who scored above 60%. SPSS version 21 (IBM Corp, 2012) was used to analyze the data. Frequencies were used for categorical variables, and the mean and standard deviation were used for continuous variables. Chi-square test was used to evaluate the difference between continuous and categorical variables, respectively. P values ≤ 0.05 were considered significant. Regression (multivariate analysis was conducted using binary/multinomial/linear regression; 95% confidence intervals (CI) and odds ratio (OR) were calculated.

Results

Table 1 presented the studied sample included 444 subjects. In all, 112 (25.2%) of the participants were healthcare providers, although 332 (74.8%) were from the population. Mean age of

Table 1: Sociodemographic characteristics of the studied samples

Variable	Frequency (*n*) (444)	Percentage
Age by years	Mean±Std. deviation	32.60±10.98
Gender		
Male	272	61.3
Female	172	38.7
Marital status		
Single	201	45.3
Married	223	52.5
Divorced/widow	10	2.3
Educational level:		
Less than high school	8	1.8
High school	95	21.4
Diploma	29	6.5
Bachelor's degree	267	60.1
Postgraduate	45	10.1
Social class by monthly income (SR)		
<10.000	270	60.8
10.000-20.000	129	29.1
>20.000	45	10.1
Type of studied population		
Healthcare providers	112	25.2
General population	332	74.8

Table 2: The differences between studied groups (health care providers and the general population) according to their sociodemographic characteristics

Studied Sample Sociodemographic character	Healthcare providers (112)		General population (332)		Significant tests *P*
	No.	%	No.	%	
Age by years	Mean±SD 28.19±7.47		Mean±SD 34.08±11.56		0.00*
Gender					
Male	64	57.1	208	62.7	0.30
Female	48	42.9	124	37.3	
Marital status					
Single	77	68.8	124	37.3	0.00*
Married	33	29.5	200	60.2	
Divorced/widow	2	1.8	8	2.4	
Educational level					
Less than high school	1	0.9	7	2.1	0.06
High school	17	15.2	78	23.5	
Diploma	9	8.0	20	6.0	
Bachelor's degree	72	64.3	195	58.7	
Postgraduate	13	11.6	32	9.6	
Social class by monthly income (SR)					
<10,000	64	57.1	206	62.0	0.00*
10,000-20,000	26	23.2	103	31.0	
>20,000	22	19.6	23	6.9	

the overall sample was 32.60 ± 10.98 years. Of the participants involved, 272 (61.3%) were males and 172 (38.7%) were females. About 223 (52.5%) participants were married, while 201 (45.3%) were single, and 10 (2.3%) were divorced or widowed. The majority (60.1%) of the participants had a bachelor's degree; the smallest group within the sample (1.8%) had not achieved a high school degree. Further, about the level of monthly income, it showed that 270 (60.8%) had a less than 10.000 Saudi Riyals (SR)/month, whereas 129 (29.1%) had between 10.000–20.000 SR/month; finally, only 45 (10.1%) of the participants more than 20.000 SR/month.

Table 2 presented the differences between studied groups (healthcare providers and the general population) according to their sociodemographic characteristics. Mean age of the healthcare providers was 28.19 ± 7.47 years which less than the mean age of the general population was 34.08 ± 11.56 years. However, this age difference was statistically significant ($P \leq 0.05$). In addition, 57.1% of the healthcare providers were males, although 42.9% were females, compared to the general population sample where 62.7% and 37.3% were males and females, respectively. These differences were statistically insignificant ($P > 0.05$).Concerning marital status, more than two thirds of the health care providers (68.8%) and more than one thirds of the general population (37.3%) were single, while one third of the health care providers (29.5%) and two thirds of the general population (60.2%) were married. In addition, only 1.8% of the healthcare providers and 2.4% of the general population were divorced or widowed. These differences were statistically significant ($P \leq 0.05$). Further, more than half of the healthcare providers and the general population had achieved a bachelor's degree (64.3% and 58.7% respectively). Only 0.9% and 2.1% of the healthcare providers and the general population, respectively, had not achieved a high school degree. These differences were statistically insignificant ($P > 0.05$). Further, regarding the monthly income, it was reported that more than half of the healthcare providers (57.1%) and more than two-thirds of the general population (62%) had a less than 10.000 SR/month, whereas less than one-third of the healthcare providers (23.3%) and more than one-third of the general population (31%) had an income within 10.000–20.000 SR/month, and less than one-third of the healthcare providers and the general population (19.6% and 6.9% accordingly) had an income of more than 20.000 SR/month. The differences were statistically significant ($P \leq 0.05$).

Table 3 presented the distribution of the studied groups according to their knowledge regarding to hydrocephalus in Saudi Arabia. The results showed that more than two thirds of the health care providers (61.6%) had positive knowledge, whereas only 17.5% of the general population had positive knowledge about the disease. These differences were statistically significant ($P \leq 0.05$). Furthermore, 89.3% of the healthcare providers facing to only 46.4% of the general population had heard or read about hydrocephalus. These differences were statistically significant ($P \leq 0.05$). In addition, only 12.5% of the healthcare providers thought that all hydrocephalus patients had the same symptoms, while more than half of them (57.1%) were aware of symptom variability, compared to only 4.2% and 14.8% of the general population, respectively. This difference was also statistically significant ($P \leq 0.05$). Regarding causes of hydrocephalus, it was noticed that most of the respondents had chosen more than one answer, and they represented 71.4% of the healthcare providers and 30.4% of the general population, whereas participants who think that psychology is the only cause were the least and they represent 0% of the healthcare provider and only 1.2% of the general population. However, this difference was statistically significant ($P \leq 0.05$). Moreover, only 17% of the healthcare providers and 14.2% of the general

Table 3: Distribution of the studied groups according to their knowledge regarding to hydrocephalus in Saudi Arabia

Studied Sample Knowledge questions	Healthcare providers (112)		General population (332)		Significant tests *P*
	No	%	No	%	
Heard or read about Hydrocephalus					
Yes	100	89.3	106	46.4	0.00*
No	12	10.7	226	53.6	
All hydrocephalus patients have the same symptoms					
Yes	14	12.5	14	4.2	0.00*
No	64	57.1	49	14.8	
I don't know	34	30.4	269	81.0	
Causes of hydrocephalus					
Accidents "Trauma" and stroke	0	0.0	7	2.1	0.00*
Brain tumor	1	0.9	5	1.5	
Inherited disease and/or birth defect and/or metabolic disease and/or	14	12.5	32	9.6	
blood diseases	0	0.0	4	1.2	
Psychology	80	71.4	101	30.4	
More than one answer	17	15.2	183	55.1	
I don't know					
Percentage of this child going to a normal school if hydrocephalus was					
diagnosed early and managed properly	19	17.0	47	14.2	0.00*
50% or more	45	40.2	80	24.1	
<50%	48	42.9	205	61.7	
I don't know					
People with shunted and well controlled hydrocephalus be successful in					
their professions (secretary, manager, physician, and scientist) as ordinary	71	63.4	131	39.5	0.00*
people	5	4.5	8	2.4	
Yes	36	32.1	193	58.1	
No					
I don't know					
It's appropriate for a person with shunted and well controlled					
hydrocephalus to get married	75	67.0	125	37.7	0.00*
Yes	2	1.8	16	4.8	
No	35	31.3	191	57.5	
I don't know					
It's appropriate for a person with hydrocephalus to have children					
Yes	70	62.5	111	33.4	0.00*
No	4	3.6	16	4.8	
I don't know	38	33.9	205	61.7	
Hydrocephalus patient can be radically cured					
Never	2	1.8	3	0.9	0.00*
Rarely	7	6.3	13	3.9	
Often	21	18.8	28	8.4	
Usually	12	10.7	20	6.0	
I don't know	33	29.5	198	59.6	
Depend on the cause	37	33.0	70	21.1	
Management options for hydrocephalus					
Excellent	35	31.3	29	8.7	0.00*
Good	22	19.6	21	6.3	
Fail	39	34.8	74	22.3	
I don't know	16	14.3	208	62.7	
A ventricular peritoneal shunt can be removed after the child has improved					
Usually	16	14.3	12	3.6	0.00*
Sometimes	31	27.7	32	9.6	
Very rare	15	13.4	25	7.5	
I don't know	50	44.6	263	79.2	
The patient requires a revision surgery to revise or change the shunt					
Excellent	33	29.5	32	9.6	0.00*
Good	34	30.4	35	10.5	
Fail	19	17.0	33	9.9	
I don't know	26	23.2	232	69.9	
Knowledge score					
Bad	43	38.4	274	82.5	0.00*
Good	69	61.6	58	17.5	

population thought that hydrocephalus patients had a chance of 50% or more to attend a normal school, compared to more than one-third of the healthcare providers (40.2%) and less than one-third of the general population (24.1%) who thinks that they have a chance of less than 50%, and this was statistically significant ($P \leq 0.05$). Finally, more than two-thirds of the healthcare providers (63.4%) and more than one-third of the general population (39.5%) thought that people with shunted and well-controlled hydrocephalus could be successful in their professions, while only 4.5% of the healthcare providers and 2.4% of the general population thought the opposite. This difference was statistically significant ($P \leq 0.05$). Regarding marriage, more than two-thirds of the health care providers (67%) thought that it was appropriate for a person with shunted and well-controlled hydrocephalus to get married, compared to more than one-third of the general population (37.7%) who thought the same way. In contrast, only 1.8% of the healthcare providers and 4.8% of the general population thought the opposite. This difference was statistically significant ($P \leq 0.05$). On having children, more than two-thirds of the healthcare providers (62.5%) and more than one-third of the general population (33.4%) thought it was appropriate for the patients with hydrocephalus to have children, in contrast to only 3.6% of the healthcare providers and 4.8% of the general population who thought it was inappropriate. This difference was statistically significant ($P \leq 0.05$). Asked if hydrocephalus patients can be cured, more than one-third of the healthcare providers (33%) and less than one-third of the general population (21.1%) believed it depended on the cause of the disease. In contrast, only 1.8% and 0.9% of healthcare providers and the general population, respectively, believed hydrocephalus patients cannot be cured. This difference was statistically significant ($P \leq 0.05$). Regarding management options, one-third of the healthcare providers (31.3%) and only 8.7% of the general population had excellent knowledge about hydrocephalus management, although 19.6% and 6.3%, respectively, had positive knowledge. In contrast, more than one-third of the healthcare providers (34.8%) and less than one-third of the general population (22.3%) had poor knowledge. This difference was statistically significant ($P \leq 0.05$). Regarding removal of the ventricular peritoneal shunt after improvement, only 14.3% of the healthcare providers and 3.6% of the general population thought the shunt was usually removed after the patient had improved; one-third of the healthcare providers (27.7%) and 9.6% of the general population thought the shunt was sometimes removed.

Table 4: Distribution of the studied samples according to their attitudes towards Hydrocephalus among health care providers and general population in Saudi Arabia

Studied sample	Healthcare providers (112)		General population (332)		Significant tests *P*
Attitude questions	No	%	No	%	
Knows someone with Hydrocephalus					
Agree	28	25.0	47	14.2	0.00*
Disagree	84	75.5	285	85.8	
Feel comfortable to tell if you have someone you care about has Hydrocephalus					
Your primary doctor	52	46.6	150	45.2	0.26
Seeking for confidentiality help	7	6.3	40	12.0	
No body	3	2.7	14	4.2	
More than two answers and/or any person	50	44.6	128	38.6	
Some children with Hydrocephalus attend a normal school					
Agree	55	49.1	67	20.2	0.00*
Disagree	22	19.6	44	13.3	
Neutral	35	31.3	221	66.6	
You discovered that your co-worker or your friend who you study with has hydrocephalus	94	83.9	209	63.0	0.00*
Continue dealing with them	0	0.0	9	2.7	
Stop dealing with them	16	14.3	89	26.8	
Contact the primary doctor	2	1.8	25	7.5	
Other					
Object to having any of your children in school or at playground associated with children with hydrocephalus	10	8.9	20	6.0	0.00*
Agree	86	76.8	168	50.6	
Disagree	16	14.3	144	43.4	
Neutral					
Advise to a relative or a friend who has a child with a skull that is growing faster than expected and engorged scalp pain	105	93.8	306	92.2	0.69
Ask for a medical doctor	2	1.8	8	2.4	
Ask for a traditional medicine doctor	4	3.6	8	2.4	
Surgery	0	0.0	2	0.6	
Think "Hydrocephalus is untreatable"	1	0.9	8	2.4	
Faith healing					
Attitude					
Bad	19	17.0	200	60.2	0.00*
Good	93	83.0	132	39.8	

Moreover, 13.4% of the healthcare providers and 7.5% of the general population thought that shunt removal was rare. This difference was statistically significant ($P \leq 0.05$). Concerning surgery to revise or change the shunt, one-third of the healthcare providers (29.5%) and only 9.6% of the general population had excellent knowledge, while 30.4% of the healthcare providers and 10.5% of the general population had positive knowledge, and 17.7% of the healthcare providers and 9.9% of the general population had poor knowledge. The results were statistically significant ($P \leq 0.05$).

Table 4 presented the distribution of the studied samples according to their attitudes towards hydrocephalus among healthcare providers and general population in Saudi Arabia. It was observed that 17.0% of the healthcare providers had a bad attitude, whereas most of them had a good attitude (83.0%). In addition, two-thirds of the general population (60.2%) had a bad attitude; whereas more than one-third (39.8%) had a good attitude. This difference was statistically significant ($P \leq 0.05$). Moreover, less than one-third of the healthcare providers and the general population (25.0% and 14.2% accordingly) knew someone with hydrocephalus. However, these differences were statistically significant ($P \leq 0.05$). Regarding feeling comfortable to disclose having someone they cared about with hydrocephalus, most of the healthcare providers and the general population reported that they would tell their primary doctor, and they represented 46.6% among healthcare providers and 45.2% among the general population, although participants who won't tell anybody were the least and represented 2.7% of the healthcare providers compared to 4.2% of the general population. However, this difference was not statistically significant ($P > 0.05$). Asked whether children with hydrocephalus can attend a normal school, half of the healthcare providers (49.1%) and less than one-third of the general population (20.2%) reported that they agreed that children with hydrocephalus could attend a normal school, while only 19.6% of the healthcare providers and 13.3% of the general population disagreed. This difference was statistically significant ($P \leq 0.05$). When asked whether participants would continue dealing with a friend or co-worker following discovery of their hydrocephalus, more than half of the participants declared they would, represented by 83.9% among the healthcare providers and 63.0% among the general population, whereas only 2.7% of the general population declared they would stop. However, this difference was statistically significant ($P \leq 0.05$). Asked if they would object to having any of their children in school or at playground associated with children with hydrocephalus, only 8.9% of the healthcare providers and 6.0% of the general population objected to such possibility, compared to 76.8% of the healthcare providers and 50.6% of the general population who raised no objections. However, this difference was statistically significant ($P \leq 0.05$). When asked what advice respondents would give to a relative or a friend whose child's skull was growing faster than expected or who experienced engorged scalp pain, most of the participants (93.8% of the healthcare providers and 92.2% of the general population) would recommend seeing a medical doctor, although only 3.6% of the healthcare providers and 2.4% of the general population would recommend surgery. None of the healthcare providers and only 0.6% of the general population thought hydrocephalus was untreatable. However, this difference was statistically insignificant ($P > 0.05$).

Table 5 presented the distribution of the sociodemographic factors according to the knowledge level of the participants regarding to hydrocephalus. The results showed that 317 (71.4%) participants had negative knowledge about hydrocephalus, while 127 (28.6%) participants had positive knowledge about the disease. In addition, 63.7% of the males and 36.3% of the females had negative knowledge about hydrocephalus, whereas half of the participants had positive knowledge about hydrocephalus. However, this was

Table 5: Distribution of the sociodemographic factors according to the knowledge level of the participants regarding to hydrocephalus

Groups of Knowledge level Sociodemographic data	Bad (317)		Good (127)		Significant tests *P*
	No	%	No	%	
Gender					
Male	202	63.7%	70	55.1%	0.09
Female	115	36.3%	57	44.9%	
Marital status					
Single	128	40.4%	73	57.5%	0.00*
Married	183	57.7%	50	39.4%	
Divorced/widow	6	1.9%	4	3.1%	
Educational level					
Less than high school	5	1.6%	3	2.4%	0.09
High school	70	22.1%	25	19.7%	
Diploma	24	7.6%	5	3.9%	
Bachelor's degree	193	60.9%	74	58.3%	
Postgraduate	25	7.9%	20	15.7%	
Social class by monthly income (SR)					
<10,000	198	62.5%	72	56.7%	0.00*
10,000-20,000	102	32.2%	27	21.3%	
>20,000	17	5.4%	28	22.0%	

Table 6: Distribution of the sociodemographic factors according to the attitude level of the participants regarding to hydrocephalus

Groups of Attitude level Sociodemographic data	Bad (219)		Good (225)		Significant Tests *P*
	No.	%	No.	%	
Gender					
Male	145	66.2%	127	56.4%	0.03*
Female	74	33.8%	98	43.6%	
Marital status					
Single	82	37.4%	119	52.9%	0.00*
Married	134	61.2%	99	44.0%	
Divorced/widow	3	1.4%	7	3.1%	
Educational Level					
Less than high school	4	1.8%	4	1.8%	0.08
High school	48	21.9%	47	20.9%	
Diploma	18	8.2%	11	4.9%	
Bachelor's degree	135	61.6%	132	58.7%	
Postgraduate	14	6.4%	31	13.8%	
Social class					
Low	144	65.8%	126	56.0%	0.00*
Mid	65	29.7%	64	28.4%	
High	10	4.6%	35	15.6%	

statistically insignificant ($P > 0.05$). Regarding marital status, less than half of participants with negative knowledge (40.4%) and more than half of participants with positive knowledge (57.5%) were single, while more than half of participants with negative knowledge (57.7%) and more than one-third of participants with positive knowledge (39.4%) were married, and only 1.9% of the participants with negative knowledge and 3.1% of the participants with positive knowledge were divorced or widowed. This was statistically significant ($P \leq 0.05$). Most of the participants with bad and positive knowledge have a bachelor's degree, and they represented 60.9% and 58.3% correspondingly, although participants with less than high school were the least and they represented 1.6% and 2.4% correspondingly. However, this difference was statistically insignificant ($P > 0.05$). Concerning the monthly income, more than two-thirds of the participants with negative knowledge (62.5%) and more than half of the participants with positive knowledge (56.7%) had a monthly income of less than 10.000 SR/month, while more than one-third of the participants with negative knowledge (32.2%) and less than one-third of the participants with positive knowledge (21.3%) had an income between 10.000 and 20.000SR/month, and only 5.4% of the participants with negative knowledge and less than one-third of the participants with positive knowledge (22%) had an income of more than 20.000 SR/month. However, this difference was significant ($P \leq 0.05$).

Table 6 presented the distribution of the sociodemographic factors according to the attitude level of the participants regarding to hydrocephalus. The results showed that 219 (49.3%) participants had a bad attitude about hydrocephalus, whereas 225 (50.7%) participants had a good attitude. Concerning gender, more than two-thirds of the males (66.2%), and more than one-third of the females (33.8%) in this study had a bad attitude about the disease, compared to more than half of males (56.4%) and less than half of females (43.6%) with a good attitude. However, this difference was statistically significant ($P \leq 0.05$). Regarding marital status, more than one-third of the participants with a bad attitude (37.4%) and more than half of the participants with a good attitude (52.9%) were single; whereas two-thirds of the participants with a bad attitude (61.2%) and less than half of the participants with a good attitude (44.0%) were married, and only 1.4% of the participants with a bad attitude and 3.1% of the participants with a good attitude were divorced or widowed. This was statistically significant ($P \leq 0.05$). More than half of the participants with bad and a good attitude had a bachelor's degree, and they represented 61.6% and 58.7% respectively, although participants with less than high school were the least and they represent 1.8% and 1.8%, respectively. However, this difference was statistically insignificant ($P > 0.05$). Regarding monthly income, more than half of the respondents with bad and good attitudes had a monthly income of less than 10.000 SR and they represented 65.8% and 56.0%, correspondingly, while participants with an income between 10.000 and 20.000SR represented 29.7% and 28.4% correspondingly, and participants with an income of more than 20.000 SR represented 4.6% and 15.6% correspondingly. However, this difference was of significance ($P \leq 0.05$).

Table 7: Multivariable logistic regression of socio-demographic factors affecting the participants knowledge level regarding to hydrocephalus

Knowledge	Sig.	OR	95% CI	
			Lower	Upper
Age	0.07	1.044	1.012	1.076
Gender				
Male	0.197	1.346	0.857	2.115
Female				
Marital Status				
Unmarried	0.222	0.689	0.380	1.252
Married				
Educational Level				
Less than high school	0.185	0.340	0.069	1.675
High school and Diploma	0.062	1.654	0.975	2.806
Bachelor's degree and postgraduate				
Social Class				
<10,000	0.00	7.354	3.498	15.461
10,000-20,000	0.00	5.718	2.607	12.539
More than 20,000				

[a]The reference category is: good

Table 8: Multivariable logistic regression of socio-demographic factors affecting the participants attitude level regarding to hydrocephalus

Attitude	Sig.	OR	95% CI	
			Lower	Upper
Age	0.655	1.006	0.981	1.031
Gender				
Male	0.034	1.563	1.034	2.360
female				
Marital Status				
Unmarried	0.001	0.410	0.240	0.700
Married				
Educational Level				
Less than high school	0.593	0.662	0.146	3.004
High school and Diploma	0.299	1.265	0.811	1.973
Bachelor's degree and postgraduate				
Social Class				
<10,000	0.00	5.361	2.424	11.859
10,000-20,000	0.15	2.733	1.215	6.164
<20,000				

[a]The reference category is: good

Table 7 presented multivariable conditional logistic regression that was performed to determine factors independently associated with knowledge about hydrocephalus. The low level of social class of participants was strongly associated with knowledge about hydrocephalus. Multivariable analysis determined that participants that gained less than 10,000 SR were seven times to have negative knowledge about hydrocephalus than the positive knowledge (mORadj = 7.35, 95% CI: 3.49–15.46). Also, participants who gained between 10,000 and 20,000 SR were 5 times to have negative knowledge comparing to positive knowledge (mORadj = 5.7, 95% CI: 2.6–12.53). Similarly, the level of education of high school and diploma participants were associated with negative knowledge nearly 1.7 times than the positive knowledge (mORadj = 1.65, 95% CI: 0.97–2.8). Gender of participants was showed that male participants had 1.3 times negative knowledge facing to positive knowledge (mORadj = 1.3,

95% CI: 0.85–2.11). Regarding to age variable it noticed that OR = 1.044.

Table 8 presents the low level of social class of participants that was strongly associated with attitude about hydrocephalus. Multivariable analysis determined that participants that gained less than 10,000 SR were 5 times to have bad attitude toward hydrocephalus compared to a good attitude (mORadj = 5.36, 95% CI: 2.42–11.85). Participants who gained between 10,000 and 20,000 SR were 2.7 times to have bad attitude toward hydrocephalus than good attitude (mORadj = 2.7, 95% CI: 1.2–6.16). In addition, gender of participants was associated with attitude about hydrocephalus. Analysis showed that male participants had 1.5 times bad attitude than good attitude (mORadj = 1.56, 95% CI: 1.03–2.36). Similarly, the level of education of high school and diploma participants was associated with bad attitude nearly 1.3 times than good attitude (mORadj = 1.26, 95% CI: 0.8–1.97). Regarding to age variable it noticed that OR = 1.006.

Discussion

This study investigated the level of healthcare providers' and general population's knowledge and types of attitudes towards hydrocephalus in Saudi Arabia. It found that most healthcare providers have positive knowledge and a good attitude toward hydrocephalus, in contrast to the general population. Even though most of the participants were educated and having bachelor's degree, they had negative knowledge regarding the chance of children going to normal school after complete recovery, management option of the disease, and if the Ventriculo-peritoneal shunt can be removed or not. Regarding the causes of hydrocephalus, most healthcare providers represented positive knowledge by choosing more than one causes out of the list of items available on the questionnaire, whereas most of the general population did not know the causes. This contrasts with a study, which took place in Uganda as the participants believe that bad luck, curses, and witchcraft were the leading causes of Hydrocephalus. In comparison, our respondents did not mention these or similar superstitious factors such as Jinn to be causes of hydrocephalus accept four individuals. Moreover, respondents reported that they believe that taking care of affected children is hopeless, as they are dying or already dead. It should be noted that in some areas in Uganda, parents are encouraged to kill their affected children by letting them fall when they are tied to their parent's back. The same study also reported that 83% of the children with hydrocephalus go to school; however, up to 60% drop out because of bullying related to hydrocephalus and spina bifida. In our study, healthcare providers thought children with hydrocephalus could attend a normal school, get married and have children, as well as be successful in their professions, as do their healthy peers. Meanwhile, most of the general population had inadequate knowledge about these issues, which suggests increasing the level of awareness in the community by having awareness campaigns about the disease is important.[13]

Another study exampled the properties of a child-completed version of the Hydrocephalus Outcome Questionnaire (cHOQ) and compared these with parental responses to the HOQ (parent version). All cognitively-capable children with previously treated hydrocephalus who were aged between 6 and 19 years were eligible. Agreement was higher for assessments of physical health, but lower for assessments of cognitive health and social-emotional health.[16]

Conclusion and Recommendations

This study revealed that the level of knowledge and attitude among the healthcare providers was good on both aspects, while it was poor among the general population. This targeted research aimed towards supporting future healthcare professionals to provide a better healthcare service and have a contribution that will significantly improve the outcomes and reduce the load over the primary healthcare centers and family physicians. The majority of participants reported good attitude toward patients with hydrocephalus by declaring feeling comfortable disclosing having someone that they care for diagnosed with this disorder. Continuing to deal with friends even if they discovered that they had the disease, not objecting if their children at school playground playing with a child with hydrocephalus, advising a relative or a friend who has a child with abnormally growing skull to seek for medical help. Health education about the disease should include awareness campaigns about the disease delivered at schools, hospitals, and commercial centers. These campaigns should be organized continuously to prevent complications and educate about the suitable treatment of the disease.

Education regarding the care of patients with shunts by providing written cards with shunt type/setting and access to reference materials seems to be effective. Developing plans for guided instruction with assessment in the clinic setting of a caregiver's knowledge is important for patient safety.[17]

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Conflicts of interest

There are no conflicts of interest.

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