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ORIGINAL ARTICLE

Level of awareness of parents toward pediatric lumbar punctures in Riyadh, Saudi Arabia

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ABSTRACT

Background: Lumbar punctures (LPs) are known as a safe procedure, but many parents refuse to perform it on their children. Therefore, this study was conducted to assess the level of knowledge of parents toward LPs in Riyadh, Saudi Arabia.

Methods: A pre-tested three-part online questionnaire that focused on knowledge, perception, and attitude was used on 1,276 adult residents of Riyadh, from November to December 2019. The data were analyzed and compared using the Chi-square test.

Result: Of 1,276 parents, 79.3% were mothers, whereas 20.7% were fathers. A larger part of the population (65.7%) had a bachelor's degree (secondary education). The analysis of the results revealed that 56.1% had a bad perception and 51.1% had poor knowledge on LP. Hence, 70.4% had a positive attitude. A significant association between educational level and knowledge and perception was found.

Conclusion: There is a direct association between a parent's knowledge of LPs and perception of LPs and level of education. The less they knew regarding LPs, the more negative they perceived the procedure, with gender and level of education affecting the outcome. Therefore, it is essential to aim the future research works and campaigns toward correcting the societal image of LPs.

Keywords: Lumbar puncture, pediatric emergency, awareness, parents.

Introduction

Central nervous system diseases are commonly encountered in the medical community, carrying high morbidity and mortality rates. Early diagnosis is the cornerstone in determining the outcome of these diseases. An essential tool to achieve this is a lumbar puncture (LP). LPs were first introduced to the medical community in 1891 by Heinrich Quicke [1]. Since then, physicians have perfected the technique to minimize the possible adverse effects. They are commonly used by different specialties, such as pediatric emergency medicine physicians, pediatricians, and pediatric neurologists.

Despite the evolution of LPs and its modification to become a safe procedure in experts' hands, many parents refuse to perform it on their children. This sets back physicians in their diagnosis and delays the administration of adequate treatment. In turn, it plays a significant role in the outcome of medical care. Furthermore, it results in a financial burden on healthcare institutions due to the prolonged admission as a consequence of delayed diagnosis and inadequate care. Delayed care is linked to higher costs and worse health outcomes. This plays a substantial role in the country's healthcare system [2].

The issue at hand is not unique to Saudi Arabia. In fact, it is a universal theme that continues to be a center of debate in the pediatric community [3]. The current refusal rate is at 30% as demonstrated by two studies done in 2000 [4,5]. A study conducted in 2010 by Manthous et al. revealed that one of the main reasons for LP refusal was

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fear of paralysis (48%). In addition, 16% of individuals were influenced by the recommendations of relatives and friends [6].

Due to the limited research on the topic, no effective strategy has been proposed to tackle the issue at hand. Thus, this study was done to assess the perception, knowledge, and attitude toward LP among parents in Riyadh, Saudi Arabia.

Subjects and Methods

This cross-sectional study aimed to assess the level of knowledge, attitude, and perception of Saudi parents toward LP. The study was carried out in Riyadh, Saudi Arabia, from November 2019 to December 2019, using a validated self-administered online questionnaire that was distributed through social media. Participants addressed in this study were Saudi parents, age over 18, residing in Riyadh, Saudi Arabia. The data were number-coded to maintain the confidentiality of all respondents.

According to the General Statistical Authority of Saudi Arabia, there were 8,660,885 Saudi adults living in Riyadh in 2019 [7]. Based on an acceptable error margin equivalent to 4% and a confidence interval of 99%, a sample size of at least 1,037 was required. In this study, a total number of respondents included in the analysis were 1,276.

The questionnaire was adapted from a previous study conducted in the eastern region with the permission of Saleh Alnajim et al. [8]. The questionnaire was modified for the purposes of this study. Thus, the questionnaire was revalidated with a Cronbach's alpha test of 0.718. The data were collected by a self-administrated questionnaire that consisted of four sections and distributed through convenience sampling. The first section consisted of the parent's demographic data. The second and third sections assessed the level of knowledge and perception about LP. The questions were answered by yes, no, or I do not know. The final section identified the parent's attitude toward LP. The questions in this section were answered as a scale from strongly agree to strongly disagree.

LP questions about knowledge consisted of nine questions; meanwhile, perception had 10 questions. Each correct answer was scored as 1, and the wrong answers were scored as 0. The number and percentage of correct and incorrect answers were calculated. The total achievable score based on the answers to all 9 questions of knowledge and 10 questions of perception was 9 and 10, respectively (100%). The participants of knowledge and perception level were categorized as good (>66.66%), fair (66.66%–33.33%), and poor (<33.33%). For questions revolving around attitude, a five-point Likert scale was used for the scoring: from 1, strongly disagree, to 5, strongly agree. The number and percentage of the answers were calculated. The participants' attitude was categorized into positive (≥80%), neutral (80%–>60%), and negative (<60%).

The qualitative data were represented as numbers and percentages in brackets. The data were analyzed and compared using the Chi-square test to examine associations between two variables. A *p*-value of less than 0.05 was considered to be statistically significant. The analysis was performed using the Statistical Package of the Social Sciences version 20.0 (IBM Corporation, Armonk, NY).

Results

A total of 1,276 participants filled the self-administered questionnaire with their demographic data as shown in Table 1. A larger number of participants were mothers with females (79.3%) and males (20.7%). Moreover, the vast majority of participants were over the age of 45 years (31.8%). In terms of the educational level, among the listed four categories, more than half of the participants had a secondary education, 838 (65.7%).

The first section tackled knowledge. Among the respondents, 51.1% had poor knowledge, 43.3% had moderate knowledge, and only 5.6% had excellent knowledge. Most of the questions were answered incorrectly. Many participants (86.4%) incorrectly thought that LP is used to diagnose the causes of headaches, whereas 75.8% of the respondents considered a computed tomography (CT) scan or magnetic resonance imaging (MRI) as an alternate to LP. Furthermore, 57.7% assumed that experienced physicians do not need LP for diagnosis, 54.1% believed that LPs should be performed after general anesthesia, and 61.6% supposed that LP was preceded by CT scan (Table 2).

As well as there was a statistically significant association between knowledge and parent (*p*-value 0.031), in which fathers had a better knowledge of LP than mothers (Table 4). However, there was no significant difference in knowledge between age groups (*p*-value 0.864).

Table 1. *Sociodemographic characteristics of the participants (n = 1276).*

General characteristics	*n*	%
Age (years)		
18–24	81	6.30
25–30	171	13.40
31–35	210	16.50
36–40	196	15.40
41–45	212	16.60
45 and above	406	31.80
Parents		
Father	264	20.70
Mother	1012	79.30
Education level		
High school	275	21.50
Secondary	838	65.70
Ph.D.	163	12.80

Table 2. *Calculated percentage of knowledge toward LP and the questions.*

Knowledge				
Score	**Frequency**	**%**	**Valid %**	**Cumulative %**
Poor (<33.3%)	652	51.1	51.1	51.1
Fair (66.66%–33.33%)	552	43.3	43.3	94.4
Good (>66.66%)	72	5.6	5.6	100
Total	1276	100	100	
Questions				
Question	**Answer**	***N***	**%**	
1. Doctors perform LP only when they suspect meningitis	Correct	212	16.6	
	Incorrect	1064	83.4	
2. Doctors do LP to diagnose some causes of headache	Correct	174	13.6	
	Incorrect	1102	86.4	
3. Doctors do LP as a therapeutic method for some causes of headache	Correct	131	10.3	
	Incorrect	1145	89.7	
4. Doctors can use a CT scan or MRI instead of LP for diagnosis	Correct	309	24.2	
	Incorrect	967	75.8	
5. Experienced physicians do not need LP for diagnosis	Correct	540	42.3	
	Incorrect	736	57.7	
6. For LP, doctors use the aseptic method	Correct	962	75.4	
	Incorrect	314	24.6	
7. LP needs general anesthesia	Correct	586	45.9	
	Incorrect	690	54.1	
8. A CT scan should be carried out before LP	Correct	490	38.4	
	Incorrect	786	61.6	
9. Performing LP does not require any specific training	Correct	955	74.8	
	Incorrect	321	25.2	

There was a significant association between knowledge of LP and education level (*p*-value <0.001) (Table 3).

Table 3. *Chi-square test of knowledge by the education of parents.*

		Knowledge			
		Poor	**Fair**	**Good**	**Total**
Education	High school	167	103	5	275
	Secondary	428	374	36	838
	Ph.D.	57	75	31	163
Total		652	552	72	1276

p-value <0.001.

Table 4. *Chi-square test of knowledge by parent.*

		Knowledge			Total
		Poor	**Fair**	**Good**	
Parents	Father	142	100	22	264
	Mother	510	452	50	1012
Total		652	552	72	1276

p-value 0.031

In the second part of the questionnaire, 56.1% of participants were scored as having poor perception, 33.7% had an acceptable perception, and 10.2% scored as the excellent perception. A greater percentage of participants incorrectly perceived that LP causes severe back pain (79.5%), paralysis (62.4%), infertility (58.5%), and urinary incontinence (70.8%). Moreover, parents believed that LP might result in severe complications (83.2%), it commonly results in meningitis (70.4%) as a side effect, and it can aggravate poliomyelitis (87.9%). They also inaccurately believed that a post LP headache can be reduced by using a distinctive type of needles (75.9%) (Table 5).

In Table 6, a significant association between perception and educational level (p-value <0.001) has been shown, but there was no significant difference between age and perception (p-value 0.507) or parent and perception (p-value 0.073).

For the section on attitude, the results were divided as follows: 898 (70.4%) had a positive attitude, 371 (29.1%) were neutral, and 7 (0.5%) were negative. Table 7 shows the positive, neutral, and negative attitudes. Respondents had positive attitudes toward performing LP at the hospital (83.4%,) with informed consent (81.2%), by residents (32.1%), and by the highest-ranking professional (59.6%). Close to half (42.6%) of the parents knew the importance of LP as a diagnostic method, and 41.1% of them believed that there is a need for more education about LP, whereas 43.1% of responses were neutral toward LP acceptance in society. Furthermore, 38.6% of the participants had a negative attitude toward LP performed by medical students. About 40% of the participants did not prefer to discharge at their own risk if the physician informs them about performing LP. In addition, 80% demanded an explanation of LP procedure when it was required by a physician. There was no significant difference between attitude, age, parent, and educational level, with p-values of 0.174, 0.301, and 0.509, respectively.

Discussion

The LP procedure plays an essential diagnostic role, as well as a role in anesthetic and therapeutic indications in several neurological pathologies. It is a common practice in the emergency department to detect CNS infections, subarachnoid hemorrhage, and inflammatory processes [9,10]. Although it is frequently performed in the pediatric population, there is a 30% refusal rate for LPs from patient caregivers [4]. The previous studies exposed a wide variety of reasons for the refusal of

Table 6. *Chi-square test of perception by education.*

		Perception			Total
		Poor	Fair	Good	
Education	High school	173	81	21	275
	Secondary	478	290	70	838
	Ph.D.	65	59	39	163
Total		716	430	130	1276

p-value < 0.001.

Table 5. *Calculated percentage of perception toward LP and the questions.*

Perception				
Score	**Frequency**	**%**	**Valid %**	**Cumulative %**
Poor (<33.3%)	716	56.1	56.1	56.1
Fair (66.66%–33.33%)	430	33.7	33.7	89.8
Good (>66.66%)	130	10.2	10.2	100
Total	1276	100	100	
Questions				
Question	**Answer**	***N***	**%**	
1. LP is a painful procedure	Correct	694	54.4	
	Incorrect	582	45.6	
2. LP can cause severe back pain	Correct	262	20.5	
	Incorrect	1014	79.5	
3. LP causes severe complications	Correct	214	16.8	
	Incorrect	1062	83.2	
4. LP can cause paralysis	Correct	480	37.6	
	Incorrect	796	62.4	
5. Meningitis is a common complication	Correct	378	29.6	
	Incorrect	898	70.4	
6. LP can cause infertility	Correct	529	41.5	
	Incorrect	747	58.5	
7. After LP, the patient may have urinary incontinence	Correct	372	29.2	
	Incorrect	904	70.8	
8. LP can aggravate the course of the poliomyelitis	Correct	154	12.1	
	Incorrect	1122	87.9	
9. Doctors can use analgesics to reduce pain during LP	Correct	707	55.4	
	Incorrect	569	44.6	
10. There are special needles that can reduce post LP headache	Correct	308	24.1	
	Incorrect	968	75.9	

Table 7. *Calculated percentage of perception toward LP and the questions.*

Attitude			
Score	***N***	**%**	
Negative (<60%)	7	0.5	
Neutral (80%–>60%)	371	29.1	
Positive (≥80%)	898	70.4	
Total	1276	100	
Questions			
Question	**Answer**	***N***	**%**
LP should be performed at a hospital	Strongly disagree	14	1.1
	Disagree	14	1.1
	Neutral	60	4.7
	Agree	124	9.7
	Strongly agree	1064	83.4
2. Informed consent should be obtained from patients or their relatives	Strongly disagree	11	0.9
	Disagree	10	0.8
	Neutral	42	3.3
	Agree	177	13.9
	Strongly agree	1036	81.2
3. LP should be performed by residents	Strongly disagree	108	8.5
	Disagree	169	13.2
	Neutral	377	29.5
	Agree	213	16.7
	Strongly agree	409	32.1
4. LP should be carried out by the highest-ranking professional	Strongly disagree	10	0.8
	Disagree	40	3.1
	Neutral	202	15.8
	Agree	263	20.6
	Strongly agree	761	59.6
5. Medical students can perform LP	Strongly disagree	493	38.6
	Disagree	460	36.1
	Neutral	249	19.5
	Agree	54	4.2
	Strongly agree	20	1.6
6. LP is not acceptable in society	Strongly disagree	26	2
	Disagree	138	10.8
	Neutral	550	43.1
	Agree	389	30.5
	Strongly agree	173	13.6
7. People do not know the importance of LP as a diagnostic method	Strongly disagree	17	1.3
	Disagree	69	5.4
	Neutral	351	27.5
	Agree	544	42.6
	Strongly agree	295	23.1
8. People do not need more education on LP	Strongly disagree	499	39.1
	Disagree	524	41.1
	Neutral	128	10
	Agree	70	5.5
	Strongly agree	55	4.3

continued

Questions			
9. If a hospital doctor tells me I need LP, I prefer to be discharged at my own risk	Strongly disagree	266	20.8
	Disagree	510	40
	Neutral	341	26.7
	Agree	110	8.6
	Strongly agree	49	3.8
10. If a hospital doctor tells me I need LP, I want him to explain the procedure	Strongly disagree	16	1.3
	Disagree	10	0.8
	Neutral	35	2.7
	Agree	194	15.2
	Strongly agree	1021	80

the procedure. The greatest part of the rejections arose from misconceptions that spread through the population [11,12]. This research looked into the knowledge, attitude, and perception to find the gap from where these misconceptions arise.

According to parents' knowledge, slightly more than half of the responders lacked knowledge about LP. The previous studies on this issue in different settings have also found that the public lacks an appropriate level of knowledge about LP [12,13]. This study brought to light that parents with higher education exhibited better knowledge and attitude about LPs; this was previously noted in studies on diabetes mellitus and stroke [14,15]. This supported that educated people are more receptive to health-related topics. Cutler et al. proposed in their economic study that people with higher education have different decision-making methods, as well as a distinct thinking process [16]. Furthermore, they established that investing in health education is an investment that would notably improve overall community health [17].

In terms of perception, 56% of the respondents had a poor perception of LP. In which, one of the questions about LP causing paralysis was answered incorrectly. Multiple respondents had the thought that LP can result in paralysis. During 1951, scientists researched LPs. In their study, scientists attributed the majority of difficulties post LP to the adverse effects from the procedure which, in turn, resulted in paralysis. The majority of these sequelae are due to one of the three: changes in cerebrospinal fluid, trauma, or infection [18]. Despite it being slim, contact with the sensory roots of the cauda equina can occur in young infants due to the proximity of cord length with the spinal canal. This initiates the generation of “shock waves” [1]. However, the shock-wave felt is transient and does not result in long-term neurological sequelae [18].

Overall respondents’ attitudes were mostly positive toward LP consistently with another study, in which the participants demonstrated satisfaction regarding LP [19]. However, in a study done by Khakshour et al., those who were satisfied had been informed about LP procedure, unlike the others who were not provided with an explanation of LP and demonstrated dissatisfaction [19].

Moreover, the present results showed that there is no relationship between the level of education and attitude. On the other hand, some researchers assessed parents’ attitude toward LP and found that parents’ education has a direct relation with their attitude [3,13]. Similarly, for gender, it was found that attitude was insignificantly related to parents. On the contrary to the present results, the previous studies showed that attitude was influenced by gender as fathers had a negative attitude more than mothers [20,21].

This study has a few limitations. First, the inclusion of only central region citizens limits the generalizability of these results to other regions. Second, the use of self-reported questionnaires limits the reliability of the results. This is due to the subjectivity of the method. In addition, the questionnaire used had a moderate reliability of the Cronbach's alpha of 0.718. Despite the limitations, this study provided valuable insights into the factors that play a role in pediatric LP approvals by parents. It also shed a light on the areas that needed improvement, such as population knowledge. It is recommended that a more representative and comprehensive population-based study should be considered in the future.

Conclusion

Through the thorough examination of the collected data, it was concluded that there is a direct association between a parent’s level of education, knowledge of LPs, and perception of LPs. A lack of knowledge on LPs reflects a negative perception toward the procedure, with gender and level of education affecting the outcome. It is recommended to obtain the confirmation of parents' understanding on explaining the procedure. Furthermore, it is essential to raise the level of awareness and knowledge through the internet and in-hospital campaigns which aim at correcting the societal image of LPs.

List of Abbreviations

LP Lumbar puncture

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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Consent for publication
Written consent was taken from all the participants.

Ethical approval
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