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### RESEARCH ARTICLE

#### COMMON MISCONCEPTIONS OF LUMBAR PUNCTURE COMPLICATIONS AMONG PARENTS IN THE EASTERN REGION OF THE KINGDOM OF SAUDI ARABIA.

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##### Key words:-

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#### Abstract

**Background:** An observed increasing prevalence of parents' refusal to give consent to lumbar puncture for their children was recorded.

**Objective:** This study was undertaken to assess the level of knowledge and attitude of Saudi parents residing in the Eastern Region of the Kingdom of Saudi Arabia towards lumbar puncture.

**Methods:** A cross-sectional study that included a representative sample of 402 adults of the Saudi parents answered self-administered questionnaires composed of items assessing the knowledge and attitude about lumbar puncture.

**Results:** There was a considerable lack of information regarding the reasons for which lumbar puncture was performed. Detailed information about the technique and its requirements also showed great defects among the studied parents. The current study also revealed increased fears from lumbar puncture, where most parents felt lumbar puncture as painful procedure that could cause severe back pain. Some parents thought that lumbar puncture will result in paralysis of the child, meningitis, infertility, urine incontinence and /or aggravate the course of poliomyelitis. Most parents showed positive attitude and disagreed to ask for discharge if physician requested permission for lumbar puncture. Moreover, high percent of them expressed their needs for more discussion and information about the procedure.

**Conclusion:** There is a considerable lack of Saudi parent's information about lumbar puncture with some beliefs and fears that could affect their acceptance and compliance with it. So, it is crucial to educate parents and the public to increase their knowledge through mass media or health campaigns.

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#### Introduction:-

Lumbar puncture (LP) is an invasive procedure performed by inserting a needle into the lower back (underneath the spinal L4 bony process) for diagnostic or therapeutic purposes. Diagnostic LP is performed to obtain samples of

cerebrospinal fluid (CSF) that can be used for diagnosis of a variety of infectious and noninfectious neurologic conditions. Therapeutic LP involves administration of drugs, including antibiotics or chemotherapeutic agents, into the CSF (Estcourt et al., 2016).

Lumbar Puncture was first reported in the late 19th Century by Heinrich IraneusQuincke, whose patient with meningitis survived 3 procedures, and around the same time Walter Essex Wynter reported the death of 4 patients undergoing Lumbar Puncture. The procedure had a poor reputation as it was associated with high mortality due to lack of imaging techniques at this time (Doherty and Forbes, 2014).

Although it is a relatively safe procedure, LP may be associated with a number of complications such as headache, infection, and bleeding. The presence of red blood cells in the CSF may point to minor bleeding. Patients with bleeding diathesis are at greater risk of spinal hematoma (Lawton et al., 1995).

Indications for LP are many including measurements of intracranial pressure. Obtaining CSF for analysis may be the only way to confirm subarachnoid hemorrhage, meningitis and neuro-inflammatory diseases (Ragauskas et al., 2012).

Informed consent of patients undergoing LP should include the risk of post-LP headache, localized bruising, bleeding and local discomfort at the injection site, in addition to rare complications such as meningitis and nerve root injury (Fishman, 1992).

Lumbar puncture is an aseptic procedure that can be carried out in the ward setting or in an operating theatre. Standard bedside aseptic procedures apply with no-touch technique, sterile drapes and use of chlorhexidine or an equivalent antiseptic. Hand-washing and wearing of masks may be associated with reduced bacterial transfer (Sellors et al., 2002).

Needle selection for LP is a critical issue. The American Academy of Neurology recommended atraumatic needles as means of reducing the risk of post-LP headache. Atraumatic needles have even been shown to be more cost-effective than classic cutting needles as patients with post-LP headache can require in-patient care (Doherty and Forbes, 2014).

A right-handed practitioner should position the patient in the left lateral decubitus position, with the vertebrae in line in the horizontal plane and the head in a neutral position and the knees flexed. Lumbar Puncture can also be performed in the seated position. If the procedure is to be performed in the upright position, seated with the chin down and the feet supported, a table and pillow will improve comfort and optimize positioning (Sandoval et al., 2004).

The most common complication of LP is post-LP headache. It has a postural component, where the patient reports worsening of headache within a few minutes of adopting upright posture and rapid improvement when lying flat. It is most probably due to loss of compliance of the spinal compartment, rather than due to loss of CSF from a continuous CSF leak. The pain is usually diffuse and accompanied by nausea, tinnitus, photophobia or neck stiffness (Thömke et al., 2000; Levine and Rapalino, 2001).

Needle selection and the use of a 22G atraumatic needle is now recommended as the most important maneuver in reducing the risk of post-LP headache (Armon and Evans, 2005). Administration of oral or intravenous fluids, the use of analgesics and antiemetics, besides maintaining a supine posture are first steps conservative management of post-LP headache, but epidural blood patching is the definitive treatment if conservative management fails (Bezov et al., 2010). Complications such as cortical vein thrombosis and reversible cerebral vasoconstriction syndrome have rarely been reported. These may present with worsening headache following LP and require additional neuro-imaging to confirm their presence (Doherty and Forbes, 2014).

The aim of this study was to assess the misconceptions regarding lumbar puncture complications and the practices that could prevent or reduce these complications among parents in the eastern region of the Kingdom of Saudi Arabia.

**Methodology:-****Ethical considerations:-**

This study was conducted after approval of the institutional review board of the responsible authorities. All candidates received a detailed explanation that included the study's purpose and methods, and a written informed consent was taken from each participant. Confidentiality of the data was maintained by making code numbers for each patient.

**Study design:-**

The current study had a cross-sectional design, and it was carried out among the general population in the Eastern Region of Saudi Arabia during the period from September, 2017 to October, 2017 to assess awareness of a sample of Saudi parents (both males and females aged more than 18 years old) regarding LP.

A self-administered questionnaire was distributed to participants by the researchers through direct contact with them. Data were confirmed then coded and entered to a personal computer. Thanks and appreciations were used to inspire the participants to be involved in the study.

**Statistical analysis:-**

All statistical analyses were done using SPSS v20. Qualitative data were represented as numbers and percentages in brackets. Fisher's Exact test was used to examine associations between two variables. Significance was adopted at  $p < 0.05$  for interpretation of results of tests.

**Results:-**

This study was carried out on 402 Saudi parents who completed the self-administered questionnaires during the study period. There were 312 (77.6%) mothers and 90 (22.4%) fathers. Their ages ranged from 18 to more than 45 and the younger age groups (18-24, 25-30) were the most frequent. The level of education of the study participants was mostly (65.7%) high, while only 15 (3.7%) had PhD degree as shown in **table 1**.

**Table 2** shows knowledge of the study participants. The majority them did not know the reason for performing LP, whereas only few numbers answered that this procedure is done for diagnosis of suspected meningitis (20.4%) or for diagnostic and/or therapeutic purposes of headache (23.6% and 18.2% respectively). When asked about CT or MRI as alternative diagnostic tools for LP, about half (50.2%) of them did not know, while only 29.1% answered that CT and MRI cannot be used instead of LP. In addition, 11.9% of the respondents were misunderstanding that experienced physicians don't need LP for diagnosis, while 38.6% disagree with them, and nearly half (49.5%) of them did not have that information. As regards knowledge about LP procedure 43.5% stated that performing LP requires specific training, while higher proportion (46.0%) did not know. The majority of the parents recognize that LP done under a septic technique and did not require general anesthesia (64.2% and 46.5% respectively). However, lower percent (44.0%) did not have knowledge about the type anesthesia under which LP is performed. Whether CT scan should be carried out before LP or not was not known by 59.0% of respondents. The level of knowledge was statistically higher ( $p < 0.05$ ) among those with post high-school education than their counterparts in most of the studied parameters.

Most of the enrolled subjects regarded LP as painful procedure that could cause severe back pain (47.5% and 53.2% respectively). But, more than half of them did not know if doctors can use analgesics to reduce this pain. Deep knowledge about presence of special needles that can be used to decrease post LP headache was low (18.2%). More than half (56.7%) of the parents did not know about safety of LP and whether it causes severe complications or not but, only 18.7% recognized it unsafe. The majority of the study participants did not have an idea about possible complications of LP. The recorded beliefs of the parents about complications of LP were as follow; induce paralysis (16.4%), cause meningitis (13.2%), infertility (4.0%), and urine incontinence (12.2%) and /or aggravate the course of poliomyelitis (12.2%) as shown in **table 3**.

Attitudes of the participating parents towards lumbar puncture were illustrated in **tables 4 & 5**. The majority of the study population settled that LP should be performed at a hospital and an informed consent should be obtained from patients or their relatives before the procedure (75.6% and 70% respectively). Majority of the parents (72.3%) approved that consultants and senior doctors should perform this procedure while lower percentage (38.0%) stated that resident doctor is capable of performing LP. Moreover, 47.8% totally disagree that medical students could

perform LP. Out of the surveyed parents, 97(24.2%) stated that LP is not acceptable in the society. Higher proportion (55.5%) was not sure about the attitude of people towards LP. More than half (58.2%) agreed that people don't know the importance of LP as a diagnostic method and most of them (75.3%) recorded that people are in need for more health education. 45.5% of the parents showed positive attitude and disagreed to ask for discharge if physician requested permission for LP. On the other hand, 44.0% of them could not give decision. Moreover, high percent (80.9%) expressed their needs for more discussion and information given by physicians. Statistically higher percentages of highly educated people agreed that medical students are incapable of performing LP and appreciated the need for more discussions about LP procedure with the treating physician. Otherwise, there was no statistically significant difference in attitudes of the parents between the three studied levels of education.

**Table 1:-** Characteristics of the study participants.

		N = 402	%
Sex	Female	312	77.6
	Male	90	22.4
Age groups (years)	18-24	122	30.3
	25-30	78	19.4
	31-35	52	12.9
	36-40	52	12.9
	41-45	31	7.7
	>45	67	16.7
Level of education	High	264	65.7
	Secondary	123	30.6
	PhD Degree	15	3.7

**Table 2:-** Knowledge of the participating parents about lumbar puncture (LP).

		Level of education								Fisher's Exact test
		Secondary		High		PhD Degree		Total		P value
		N	%	N	%	N	%	N	%	
Doctors perform LP only when they suspect meningitis	Yes	27	22.0	50	18.9	5	33.3	82	20.4	.022*
	No	21	17.1	83	31.4	4	26.7	108	26.9	
	Don't know	75	61.0	131	49.6	6	40.0	212	52.7	
Doctors do LP to diagnose some causes of headache	Yes	20	16.3	68	25.8	7	46.7	95	23.6	.040*
	No	22	17.9	46	17.4	3	20.0	71	17.7	
	Don't know	81	65.9	150	56.8	5	33.3	236	58.7	
Doctors do LP as a therapeutic method for some causes of headache	Yes	20	16.3	51	19.3	2	13.3	73	18.2	.006*
	No	21	17.1	47	17.8	9	60.0	77	19.2	
	Don't know	82	66.7	166	62.9	4	26.7	252	62.7	
Doctors can use CT scan or MRI instead of LP for diagnosis	Yes	31	25.2	46	17.4	6	40.0	83	20.6	<.001*
	No	21	17.1	89	33.7	7	46.7	117	29.1	
	Don't know	71	57.7	129	48.9	2	13.3	202	50.2	
Experienced physicians don't need LP for diagnosis	Yes	18	14.6	27	10.2	3	20.0	48	11.9	.004*
	No	36	29.3	109	41.3	10	66.7	155	38.6	
	Don't know	69	56.1	128	48.5	2	13.3	199	49.5	
For LP, doctors use aseptic methods	Yes	66	53.7	180	68.2	12	80.0	258	64.2	.006*
	No	5	4.1%	3	1.1	1	6.7	9	2.2	
	Don't know	52	42.3	81	30.7	2	13.3	135	33.6	
LP needs general anesthesia	Yes	13	10.6	23	8.7	2	13.3	38	9.5	.052
	No	49	39.8	127	48.1	11	73.3	187	46.5	
	Don't know	61	49.6	114	43.2	2	13.3	177	44.0	
A CT scan should be carried out before LP	Yes	32	26.0	93	35.2	9	60.0	134	33.3	.021*
	No	8	6.5	21	8.0	2	13.3	31	7.7	
	Don't know	83	67.5	150	56.8	4	26.7	237	59.0	
Performing LP does not	Yes	10	8.1	29	11.0	3	20.0	42	10.4	.001*

require any specific training	No	43	35.0	121	45.8	11	73.3	175	43.5	
	Don't know	70	56.9	114	43.2	1	6.7	185	46.0	

\*Significant

**Table 3:-** Perceptions of the participating parents about lumbar puncture (LP).

		Level of education								Fisher's Exact test
		Secondary		High		PhD Degree		Total		P value
		N	%	N	%	N	%	N	%	
LP is a painful procedure	Yes	46	37.4	136	51.5	9	60.0	191	47.5	.057
	No	10	8.1	19	7.2	2	13.3	31	7.7	
	Don't know	67	54.5	109	41.3	4	26.7	180	44.8	
LP can cause severe back pain	Yes	29	23.6	83	31.4	4	26.7	116	28.9	.010*
	No	17	13.8	48	18.2	7	46.7	72	17.9	
	Don't know	77	62.6	133	50.4	4	26.7	214	53.2	
LP causes severe complications	Yes	26	21.1	46	17.4	3	20.0	75	18.7	.313
	No	24	19.5	69	26.1	6	40.0	99	24.6	
	Don't know	73	59.3	149	56.4	6	40.0	228	56.7	
LP can cause paralysis	Yes	16	13.0	44	16.7	6	40.0	66	16.4	.001*
	No	28	22.8	86	32.6	7	46.7	121	30.1	
	Don't know	79	64.2	134	50.8	2	13.3	215	53.5	
Meningitis is a common complication of LP	Yes	8	6.5	41	15.5	4	26.7	53	13.2	.023*
	No	23	18.7	45	17.0	4	26.7	72	17.9	
	Don't know	92	74.8	178	67.4	7	46.7	277	68.9	
LP can cause infertility	Yes	4	3.3	10	3.8	2	13.3	16	4.0	.122
	No	41	33.3	98	37.1	8	53.3	147	36.6	
	Don't know	78	63.4	156	59.1	5	33.3	239	59.5	
After LP the patient may have urinary incontinence	Yes	12	9.8	35	13.3	2	13.3	49	12.2	.002*
	No	24	19.5	60	22.7	10	66.7	94	23.4	
	Don't know	87	70.7	169	64.0	3	20.0	259	64.4	
LP can aggravate the course of the poliomyelitis	Yes	15	12.2	30	11.4	4	26.7	49	12.2	.040*
	No	20	16.3	52	19.7	6	40.0	78	19.4	
	Don't know	88	71.5	182	68.9	5	33.3	275	68.4	
Doctors can use analgesics to reduce pain during LP	Yes	47	38.2	111	42.0	11	73.3	169	42.0	.092
	No	8	6.5	23	8.7	0	0.0	31	7.7	
	Don't know	68	55.3	130	49.2	4	26.7	202	50.2	
There are special needles that can reduce post LP headache	Yes	16	13.0	50	18.9	7	46.7	73	18.2	.009*
	No	10	8.1	14	5.3	2	13.3	26	6.5	
	Don't know	97	78.9	200	75.8	6	40.0	303	75.4	

\*Significant

**Table 4:-** Attitudes of the participating parents towards lumbar puncture (LP).

		Level of education								Fisher's Exact test
		Secondary		High		PhD Degree		Total		
		N	%	N	%	N	%	N	%	P value
LP should be performed at a hospital	Completely agree	61	49.6	163	61.7	12	80.0	236	58.7	.167
	Agree	25	20.3	42	15.9	1	6.7	68	16.9	
	Neutral	32	26.0	56	21.2	2	13.3	90	22.4	
	Disagree	3	2.4	1	0.4	0	0.0	4	1.0	
	Completely disagree	2	1.6	2	0.8	0	0.0	4	1.0	
Informed consent should be obtained from	Completely agree	45	36.6	106	40.2	9	60.0	160	39.8	.453
	Agree	34	27.6	82	31.1	5	33.3	121	30.1	
	Neutral	40	32.5	70	26.5	1	6.7	111	27.6	

patients or their relatives	Disagree	2	1.6	4	1.5	0	0.0	6	1.5	
	Completely disagree	2	1.6	2	0.8	0	0.0	4	1.0	
LP should be performed by residents	Completely agree	14	11.4	23	8.7	5	33.3	42	10.4	.024*
	Agree	27	22.0	80	30.3	4	26.7	111	27.6	
	Neutral	56	45.5	130	49.2	4	26.7	190	47.3	
	Disagree	19	15.4	26	9.8	2	13.3	47	11.7	
	Completely disagree	7	5.7	5	1.9	0	0.0	12	3.0	
LP should be carried out by the highest ranking professional	Completely agree	65	52.8	135	51.1	10	66.7	210	52.2	.496
	Agree	22	17.9	57	21.6	2	13.3	81	20.1	
	Neutral	30	24.4	60	22.7	2	13.3	92	22.9	
	Disagree	3	2.4	11	4.2	1	6.7	15	3.7	
	Completely disagree	3	2.4	1	0.4	0	0.0	4	1.0	
Medical students can perform LP	Completely agree	6	4.9	2	0.8	5	33.3	13	3.2	<.001*
	Agree	10	8.1	15	5.7	1	6.7	26	6.5	
	Neutral	53	43.1	116	43.9	2	13.3	171	42.5	
	Disagree	27	22.0	80	30.3	3	20.0	110	27.4	
	Completely disagree	27	22.0	51	19.3	4	26.7	82	20.4	

\*Significant

**Table 5:-** Attitudes of the participating parents towards lumbar puncture (LP).

		Level of education								Fisher's
		Secondary		High		PhD Degree		Total		Exact test
		N	%	N	%	N	%	N	%	P value
LP is not acceptable in society	Completely agree	10	8.1	17	6.4	3	20.0	30	7.5	.215
	Agree	18	14.6	47	17.8	2	13.3	67	16.7	
	Neutral	77	62.6	140	53.0	6	40.0	223	55.5	
	Disagree	9	7.3	36	13.6	2	13.3	47	11.7	
	Completely disagree	9	7.3	24	9.1	2	13.3	35	8.7	
People don't know the importance of LP as a diagnostic method	Completely agree	19	15.4	53	20.1	6	40.0	78	19.4	.295
	Agree	43	35.0	109	41.3	4	26.7	156	38.8	
	Neutral	56	45.5	88	33.3	5	33.3	149	37.1	
	Disagree	2	1.6	7	2.7	0	0.0	9	2.2	
	Completely disagree	3	2.4	7	2.7	0	0.0	10	2.5	
People don't need more education on LP	Completely agree	3	2.4	5	1.9	1	6.7	9	2.2	.279
	Agree	5	4.1	7	2.7	0	0.0	12	3.0	
	Neutral	29	23.6	48	18.2	1	6.7	78	19.4	
	Disagree	40	32.5	79	29.9	3	20.0	122	30.3	
	Completely disagree	46	37.4	125	47.3	10	66.7	181	45.0	
If a hospital doctor tells me I need LP I prefer to be discharged at my own risk	Completely agree	7	5.7	8	3.0	1	6.7	16	4.0	.168
	Agree	7	5.7	18	6.8	1	6.7	26	6.5	
	Neutral	59	48.0	116	43.9	2	13.3	177	44.0	
	Disagree	37	30.1	83	31.4	8	53.3	128	31.8	
	Completely disagree	13	10.6	39	14.8	3	20.0	55	13.7	
If a hospital doctor tells me I need LP I want him to explain the procedure	Completely agree	64	52.0	172	65.2	12	80.0	248	61.7	.040*
	Agree	28	22.8	48	18.2	1	6.7	77	19.2	
	Neutral	26	21.1	41	15.5	1	6.7	68	16.9	
	Disagree	2	1.6	2	0.8	1	6.7	5	1.2	
	Completely disagree	3	2.4	1	0.4	0	0.0	4	1.0	

\*Significant

**Discussion:-**

Lumbar puncture is an important and relatively safe procedure to diagnose underlying central nervous system problems in children, mainly meningitis (Sadek et al., 2016). Different studies in developing countries have recorded rising prevalence of parents' refusal to give consent to LP for their children. This was attributed to false cultural beliefs, perceptions and fears among parents regarding this procedure (Deng et al., 1994; Ling and Boey, 2000; Farag et al., 2009; Narchi et al., 2013). So, this study was undertaken to assess the level of knowledge and attitude of Saudi parents towards LP, so that common misconceptions about LP could be explored. This will be helpful in developing solutions to enhance acceptance among parents.

An important factor that affects parent's decision is their knowledge. In this study, there was considerable lack of information regarding the reasons for which LP was performed and whether CT or MRI could be good alternatives. In addition, some respondents falsely believed that experienced physicians don't need LP for diagnosis. Detailed information about LP technique and its requirements also showed great defects among the studied parents. Similarly, A Malaysian study among staff in a public university revealed high frequency (74%) of poorly informed subjects about LP (W.A. Wan Sulaiman, et al., University Putra Malaysia, article in press).

The current study revealed increased fears from LP, where most of the enrolled subjects felt LP as painful procedure that could cause severe back pain. Moreover, more than half of them did not know that this pain could be reduced by using analgesics or special types of needles. Knowledge about the safety of this procedure was assessed. The majority of the parents in our study did not have an idea about possible complications of LP. Some parents thought that LP will result in paralysis of the child, meningitis, infertility, urine incontinence and /or aggravate the course of poliomyelitis. Similar fears of complications and particularly paralysis were recorded by parents in similar regional studies in Kuwait and United Arab Emirates (Farag et al., 2009 and Narchi et al., 2013).

In addition, a study by Wong et al. (2010) showed that fear of paralysis (48%) and mental retardation (6%) was the main reason of LP dissatisfaction by parents. The same fears were recorded in Iranian population by Khakshour et al. (2013). An earlier Asian study, which interviewed Malays, Indians and Chinese mothers revealed similar fears of pain, paralysis or death of their children with LP (Deng et al., 1994).

Most of parents in this survey showed positive attitude and disagreed to ask for discharge if physician requested permission for LP. Moreover, high percent of them expressed their needs for more discussion and information about the procedure. Wan Sulaiman et al. (2017) also reported highly frequent (72%) moderate attitude score towards LP among their Malaysian participants. This constitutes a favorable finding but, this might be limited by its theoretical situation. Further studies to assess the parent's attitudes towards acceptance or refusal of LP in a true situation where their children are in need of LP and the study of the associated factors with refusal are recommended.

Out of the surveyed parents, 24.2% stated that LP is not acceptable in the society. More than half (58.2%) agreed that people don't know the importance of LP as a diagnostic method and most of them (75.3%) recorded that people are in need for more health education. These parents' views accentuate the importance of successful education of the public through mass media or health campaigns. It is important that the treating physician informs parents with simple, clear and precise information about the requested procedure. Using of diagrammatic or visual aids could be helpful.

**Conclusion:-**

There is considerable lack in Saudi parent's information about LP with some beliefs and fears that could affect their acceptance and compliance with LP. So, it is crucial to educate parents and the public to increase their knowledge through mass media or health campaigns.

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