

LUMBER PUNCTURE FOR SUSPECTED CENTRAL NERVOUS SYSTEM INFECTIONS- EVALUATION OF REFUSAL RATE AND ASSOCIATED FACTORS

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INTRODUCTION

Lumbar Puncture (LP) is an invasive procedure that can be performed for both diagnostic and therapeutic purposes and it is important to rule out different forms of meningitis and encephalitis(1-3). For lumbar puncture a needle is inserted into the tissues of lumbar region to reach the spinal canal to obtain the cerebrospinal fluid (CSF) (4-7). In pediatric population it is performed to collect CSF for establishing the diagnosis and management of neurological diseases including CNS infections(6, 8,9,10). It is a safe procedure if performed in the absence of raised intracranial pressure. Complications are rare, but include minor discomfort, headache, backache and local bleeding (2). Obtaining informed consent from patients or their family prior to performing LP is a universal recommendation(8). However, refusal to LP is the common issue encountered throughout the world. However, reported refusal rates vary in different countries, where Unites States of America has 5%, Malaysia in 25%, while 62% in Iran and 80% in Kuwait(11,12,13).

Failure to perform LP, especially in resource limited settings is associated with greater morbidity and mortality due to delayed diagnosis and improper management (14).The refusal often results in hospital admission for empirical intravenous antibiotics that besides increasing use of hospital resources, also increase duration of hospital stay, further exposing patients to nosocomial infections leading to further risk of rising antibiotic resistance (15). As the diagnosis in patients with LP refusal is usually delayed hence risk of incomplete treatment, and longer duration of hospital stay, increasing further risk of com-

ABSTRACT

Lumbar Puncture (LP) can be performed for both diagnostic and therapeutic purposes. Failure to perform LP is associated with greater morbidity and mortality due to delayed diagnosis and improper management. This study was conducted to evaluate frequency of LP refusal and its associated factors among parents of children hospitalized with suspected Central Nervous System (CNS) infections. This cross-sectional study was conducted from October 2021 to April 2022 at National Institute of Child Health (NICH), Karachi, Pakistani. Parents/attendants of all pediatric patients hospitalized with suspected CNS infections and advised LP by the treating physicians were included in the study. A semi-structured questionnaire was used to assess the perception and attitude of patients' towards the procedure and if they agreed for their child to undergo LP. Parents of 338 children were enrolled, out of which 203(60.1%) consented for LP. Majority refused because of fear of complications followed by those who believed LP was not required (29%). Common misconceptions regarding LP complications were risk of death (13%), epilepsy (11%) and paralysis (7%). Significantly lower refusals were observed when no other course was offered as alternate to LP (p-value <0.001). There was high frequency of LP refusal among parents of pediatric patients presenting with suspected CNS infections, most important cause of refusal was fear of complications.

plications (16). From epidemiological point of view refusals to LP results in underestimation of laboratory proven cases of meningitis (17). It is important to identify the perceptions and attitude of patients or their attendants towards LP in order to address the issue of refusals. Many studies have shown that usual reason for refusal of LP were fear of paralysis, mental retardation, child death and painfulness of the procedure and parents had these misconceptions because of their insufficient guidance for LP(16,18). Lumber puncture refusal has also been observed as a common issue in Pakistan but the data regarding its frequency and associated factors is limited in particular with reference to pediatric patients. Hence, this study was aimed to evaluate the frequency of LP refusal and its associated factors among parents of children hospitalized with suspected CNS infections at a leading tertiary care dedicated service for children in Pakistan.

METHODS

This cross-sectional study was conducted from October 2021 to April 2022 at National Institute of Child Health (NICH), Karachi, which is one of the largest tertiary care children hospitals of Pakistan. As per NICH policy, LP can only be performed after written consent is obtained from the parents of the child. Parents/attendants of all patients between ages 1 month to 12 years hospitalized with suspected CNS infections in any of the three medical units of NICH and advised LP by the treating physician were included in the study. Purposive sampling technique was used to enroll all patients, meeting the inclusion criteria. Patient's demographic information as well as pertinent clinical and laboratory data were recorded from their medical files after taking informed consent from patients' parents or attendants. Parents of these patients were then interviewed using a semi-structured questionnaire regarding their perceptions and attitudes towards LP and whether they agreed or not for their child to undergo LP.

Statistical analysis: Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 25. Frequencies and percentages were calculated for categorical variables. Comparisons between parents who consented and those who refused were done with respect to demographic & clinical features and parent's awareness regarding LP. A p-value <0.05 was considered significant for all statistical tests applied.

RESULTS

A total of 338 children were enrolled including 185 (54.7%) male and 153 (45.3%) female patients. Majority (n=115, 34.0%) of patients were up to 1 year of age followed by 111 (32.8%) in the age group between 1 to 5 years, 66 (19.5%) in age group between 6 to 10 years and only 6 (1.8%) patients above 10 years of age. Clinical signs and symptoms of majority (n =223, 66%) of patients were suggestive of meningitis followed by encephalitis (n=45,13.3%), febrile fits (n=40,11.8%), Subacute sclerosing panencephalitis (SSPE) (n=22,65.1) and Guillain -Barr'e Syndrome (GBS) in 8 (2.4%) patients. Out of total 338 patients who were advised LP, parents of only 203(60.05%) children consented while 135 (39.9%) refused for LP. The majority of parents (n=66, 49%) refused because they feared any complications followed by those who believed that LP is not required 39(29%) while 19 (14%) preferred their family opinion and 11 (8%) consulted some other physicians.

The parents' perception regarding LP complications, majority 199 (58%) did not think that it may lead to any complications. However common LP complications perceived by parents included death (n= 43 ,13%) followed by epilepsy (n=38, 11%), paralysis (n=22,7%) mentally handicapped (n=20, 6%) and developmental delays(n=16 , 5%). A summary of the comparison of consenting and non-consenting parents is given in Table 1.

Table 1. Comparison of demographic features of consenting and non-consenting parents

Variable	Categories	Consent Given for LP		p-value
		Given n (%)	Not given n (%)	
Gender	Male 186(55%)	102 (54.8)	84 (45.2)	0.030
	Female 152 (45%)	101 (66.4)	51 (33.6)	
Total	338 (100%)	203(60%)	135(40%)	
Patients' Age	Up to 1year	68 (43.9)	87 (56.1)	<0.001
	1-5 years	80 (72.1)	31 (27.9)	
	>5year	55 (76.4)	17 (23.6)	
Father's age	<30 years	95 (56.2)	74 (43.8)	0.009
	31-40 years	100 (62.1)	61 (37.9)	
	>40 years	8 (100)	0 (0.0)	
Mother's Age	<30 years	160 (58.6)	113 (41.4)	0.018
	31-40 years	39 (73.6)	14 (26.4)	
	>40 years	4 (33.3)	8 (66.7)	
Fathers' Educa- tion	Illiterate	66 (53.2)	58 (46.8)	0.001
	Up to Primary	68 (62.4)	41 (37.6)	
	Secondary	65 (73.0)	24 (27.0)	
	Graduate	4 (25.0)	12 (75.0)	
Mothers' Edu- cation	Illiterate	118 (58.7)	83 (41.3)	<0.001
	Up to Primary	55 (52.4)	50 (47.6)	
	Secondary	24 (92.3)	2 (7.7)	
	Graduate	6 (100)	0 (0.0)	

Comparison between patient's clinical features with respect to parents' consent is shown in Table 2. Parents of children with SSPE or febrile fits were observed to have higher consenting rates as compared to others (p-value <0.001). While parents of only 199 (59.6%) patients with fits consented for LP however, consent rate was significantly higher (p-value <0.001) in parents whose children presented with focal or myoclonic fits as compared to those with tonic or generalized tonic fits (Table 2). Altered mental status did not show any significant association with consent rate (p-value 0.871).

Among all these parents 302(89.3%) had previous knowledge of LP and source of prior knowledge was relatives in 184(60.9%) or friends & family in 118 (39.1%). Among those who has previous knowledge of LP only 268(88.7%) had knowledge about indication for LP while knowledge of technique was found in only 57(18.8%) families. A comparison of parents' prior knowledge or experience regarding LP and its association with LP consent or refusal is presented in Table 3, which shows that LP refusal was significantly higher among parents who had previously heard about LP, its indication or complication or who knew someone who underwent LP or who developed some complication after LP.

Table 4 shows the comparison of parental decision with respect to consent process at the hospital. The data depicts that refusals were significantly lower in case when a Postgraduate doctors obtained consent as compared to a house officer (p-value <0.001). Similarly significant lower refusals were observed when no other alternative was offered or when advantages and disadvantages of LP were explained to parents. Refusal rates were significantly higher for diagnostic LP as compared to therapeutic LP (p-value 0.002)

Table 2. Comparison of clinical features of children and parental decision regarding Lumber Puncture consent

Clinical Feature		Consent Given for LP		p-value
		Given n (%)	Not given n (%)	
Provisional Diagnosis	Febrile Fits	36 (90.0)	4 (10.0)	<0.001
	Meningitis	123 (55.2)	100 (44.8)	
	Encephalitis	18 (40.0)	27 (60.0)	
	SSPE	22 (100)	0 (0.0)	
	GBS	4 (50.0)	4 (50.0)	
Total		203(60.05%)	135(39.9%)	
Fits	Yes	199 (59.6)	135 (40.4)	0.043
	No	4 (100)	0 (0.0)	
Fever	Yes	151 (52.8)	135 (47.2)	<0.001
	No	52 (100)	0 (0.0)	
Type of fits	Gen.Tonic Clonic	112 (51.9)	104 (48.1)	<0.001
	Focal	49 (80.3)	12 (19.7)	
	Tonic	18 (58.1)	13 (41.9)	
	Myoclonic	20 (76.9)	6 (23.1)	
Mental Status	Normal	150 (60.0)	100 (40.0)	0.871
	Altered	50 (61.0)	32 (39.0)	
	Coma	3 (50.0)	3 (50.0)	

Table 3. A comparison of parents' prior knowledge or experience regarding Lumber Puncture

Question	Response	Consent given for LP		p-value
		Given n (%)	Not given n (%)	
Prior information regarding LP?	Yes	173 (57.3)	129 (42.7)	0.03
	No	30 (83.3)	6 (16.7)	
Source of prior knowledge?	Doctor	24 (60.0)	16 (40.0)	0.709
	Friends/family	149 (56.9)	113 (43.1)	
Prior knowledge regarding indication of LP	Yes	148 (55.2)	120 (44.8)	<0.001
	No	55 (78.6)	15 (21.4)	
Prior knowledge about LP technique	Yes	37 (72.5)	14 (27.5)	0.048
	No	166 (57.8)	121 (42.2)	
Knowledge about complications of LP	Yes	102 (55.1)	83 (44.9)	0.042
	No	101 (66.0)	52 (34.0)	
Known someone who had LP?	Yes	106 (45.3)	128 (54.7)	<0.001
	No	97 (93.3)	7 (6.7)	
Known someone who had complication after LP	Yes	37 (25.2)	110 (74.8)	<0.001
	No	166 (86.9)	25 (13.1)	

Table 4. Factor affecting parent's decision with respect to consent process

		Consent Given for LP		p-value
		Given n (%)	Not given n (%)	
Designation of requesting doctor	House officer	50 (45.5)	60 (54.5)	<0.001
	Postgraduate training	153 (67.1)	75 (32.9)	
Any other alternative offered	Yes	1 (0.9)	107 (99.1)	<0.001
	No	202 (87.8)	28 (12.2)	
Advantages of LP explained?	Yes	201 (61.3)	127 (38.7)	0.022
	No	2 (20.0)	8 (80.0)	
Kind of advantages explained	Diagnostic	126 (54.5)	105 (45.5)	0.001
	Preventive/Therapeutic	64 (75.3)	21 (24.7)	
Disadvantages of LP explained?	Yes	113 (53.6)	98 (46.4)	0.002
	No	90 (70.9)	37 (29.1)	
Kind of disadvantages explained	Backache	41 (51.9)	38 (48.1)	<0.001
	Bleeding	19 (33.9)	37 (66.1)	
	Headache	8 (47.1)	09 (52.9)	
	Paralysis	3 (25.0)	9 (75.0)	
	Infection	41 (91.1)	4 (8.9)	

DISCUSSION

Cerebrospinal fluid examination via LP is essential for diagnosis of CNS infections and sometimes repeat LP is performed to see the response of the treatment. Although it is effective for diagnosis and management, still there are higher rates of refusal in different regions of the world (19). In our study the rate of LP refusal was 39.9%, which suggests that on average one out of three parents refused. Similar findings have been reported by Mushtaq Ahmed et al from Karachi who reported LP refusal rate of 32.6%(18) while it was 43% in the study by Haseeb Narchi et al in Al Ain Hospital UAE(15). Another study from Kuwait reported 42.5% refusals for LP (12). This was higher than in other studies who reported rate of LP refusal was 25-9% (17, 19). In our study the refusal rate was higher for male (45.1%) patients as compared to females. Which is slightly lower to the study by Nasma Najji Al-Hajjiah where it was reported to be 51.4% refusal in male children (15)

Among demographic factors, the rate of refusal was significantly higher in patients less than 1 year of age as compared to other age groups in contrast to other study by Mushtaq Ahmed et al where they have reported higher consent rate for children younger than six months (18). Parents' age and education status was also significantly associated with consenting rate as parents aged less than 30 years and those without any formal education more frequently refused for LP. This is in contrast to a previously reported study where there was no significant association of age and education with the refusal (13). This may be linked with the awareness of the procedure.

In our study the signs and symptoms of the great majority of patients were suggestive of meningitis followed by encephalitis, SSPE, febrile fits and GBS. This is in contrast to the study by Acoglu, Esma Altinel et al in which majority of patient's neurological disease had in 45.25% of the patients, central nervous system infection in 45.25%, and acute encephalopathy in 9.5%(20). In contrast to other study where they found meningitis 45-55% patients(13, 20).

Regarding provisional diagnosis the LP refusal rate was highest for encephalitis followed by GBS and meningitis, same has been observed by another study where there was higher refusal rate for meningococcal meningitis followed by meningitis (13). In parents reasoning for LP refusal, 49% refused because of fear of complications, 29% refused because they thought LP is not needed while 19% preferred their family and 11% preferred some other physician's opinion. Major fear of complication for LP refusal was risk of death 13% followed by epilepsy 11% and paralysis 7%. This has been shown by other studies where the fear of paralysis and fear of death, fear of pain or trauma were reasons for refusal (2, 12).

We had higher refusal rate in parents who had prior knowledge of LP and the source of prior knowledge were most commonly observed to be friends & family. Similarly, parents with prior knowledge and experience of some complications in their friends and family had significantly higher rates of refusal. Similar results have been shown by another study where source of prior knowledge was relatives and friends while prior knowledge of known complications of epilepsy, developmental delays and other complications were significantly associated with high refusal rate (19).

We had significantly high refusal rate when consent was taken by house officer as compared to the postgraduate doctor. This is in contrast to other studies where there was no significant relation reported with respect to doctor's designation(15). However, this could be logical as more senior doctor can explain the need of LP and related complications in a better way than a junior doctor such as a house officer. Lumbar Puncture refusal rate was significantly higher if parents were offered any other alternatives. Similar has been shown by other studies where LP refusal rate was significantly higher when some alternatives to LP was offered (15). Nonetheless LP is an invasive procedure with default complications and associated risks. Thus if any alternative is offered parents would choose less invasive first thus refusal rate would go up. This was a prospective questionnaire based study from a single centre. However, the sample size was smaller and the consequences of refusal of LP were not recorded. Thus it is taken as limitation of the study.

CONCLUSION

There is high frequency of LP refusal in pediatric population and most important risk factor for refusal is the fear of complications. Parent's education about LP safety and its effectiveness may improve the perception about the importance of LP and therefore the refusal rate may reduce.

ETHICAL CONSIDERATION: Study was approved from Institutional ethical review board of NICH and written informed consent was taken from parents before enrolling patients.

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CONFLICT OF INTEREST: Authors declare no conflict of Interest

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