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Assessment of the Incidence of Complications among Patients Undergoing Lumbar Puncture

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Abstract:

Introduction: Lumbar puncture is a diagnostic and therapeutic procedure performed by inserting a needle into the subarachnoid space to collect cerebrospinal fluid. Though generally considered safe, Lumbar puncture carries risks of complications such as PHPL, back pain, and in rare cases, cerebral herniation. Proper patient knowledge and informed consent are essential to reduce these risks and improve patient outcomes. **Aim:** This study aims to assess the incidence of complications among patients undergoing lumbar puncture. **Design:** A descriptive exploratory research design was utilized. **Setting:** The study was conducted at Zagazig University Hospital in the departments of general surgery, urology, orthopedics, and intensive care unit. **Subjects:** A purposive sample of seventy patients who had undergone lumbar puncture and agreed to participate was included. **Tools:** Data were collected using Patients structured interview questionnaire that assessed Patient personal characteristics, medical history, knowledge of Lumbar puncture, and post-procedural complications. **Results:** The results indicated that more than sixty percent of the patients had unsatisfactory knowledge regarding lumbar puncture. Complications were prevalent, with seventy percent who reporting post-lumbar puncture headaches and more than eighty percent reported back pain. **Conclusion:** The results of the study indicate a significant gap in knowledge regarding lumbar puncture among patients, and the complication assessment revealed that majority of patients experienced post-procedure complications issues including headache and back pain. The study also highlighted significant relationships between patients' demographics characteristics and knowledge and experience of post-lumbar puncture headache. **Recommendations:** Develop educational materials to inform patients about lumbar puncture and its risks. Implement standardized post-procedure care protocols. Provide continuous professional training for healthcare providers.

Keywords: *Complications, Incidence, Lumbar puncture.*

Introduction:

Lumbar puncture is a procedure performed to collect cerebrospinal fluid from the subarachnoid space through a puncture between 2 lumbar vertebrae. Although adverse events and failures occur, most can be avoided with proper practices (**Cognat et al., 2021).**

Lumbar puncture is the process of inserting a needle into subarachnoid space in lumbar cistern for diagnostic purposes (measuring cerebrospinal fluid pressure, sampling cerebrospinal fluid for laboratory analysis, and applying contrast agents for radiological imaging, etc.) and/or for therapeutic reasons (**Ljubisavljevic, 2020).**

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Lumbar puncture is a commonly performed medical procedure that is crucial for the diagnosis and treatment of central nervous system (CNS) infections, neurological diseases, and certain types of cancer. Spinal hematoma may be caused by lumbar puncture and presents as severe back pain, radiculopathy, urinary incontinence, and inferior paraparesis **(Bodilsen, et al., 2020)**

Complications of lumbar puncture may include headache, backache, infection, lower limb weakness, subdural hematoma, bleeding or cerebrospinal fluid leak from the puncture site, nerve damage or brain herniation. Headache and backache are the most common complications post lumbar puncture while infection, lower limb weakness, bleeding or cerebrospinal fluid leak, subdural hematoma, nerve damage and brain herniation are uncommon. Lumbar puncture often causes anxiety and stress for patients. In order to minimize patients` discomfort and possible post lumbar puncture complications, the nurse must orient patients and their families about instructions regarding lumbar puncture before, during, and after the procedure **(Arshad et al., 2022)**

Nursing role before lumbar puncture procedure, nurses should inform patients about the procedure. Informed consent must be obtained. Ask patients to empty bowel and bladder. Nurses should perform complete neurological assessment for patients, measure vital signs, prepare equipment and review results of the laboratory tests especially coagulation studies and notify neurosurgeon for any abnormalities **(Ahmed et al., 2021)**

Nursing role during lumbar puncture procedure, any patients` movement should be avoided to avoid nerve injury, administer prescribed sedation if required and reassurance may be helpful. Patients usually lies in lateral position, move back closed to edge of bed, draw knees toward chest as tight as possible and flex chin onto the chest. Nurses should follow sterile aseptic technique during procedure. Nursing role after lumbar puncture, nurses assess patients for any complications, lying flat for 4 hours is recommended, patients` vital signs should be measured, if not contraindicated encourage patients to increase fluid intake and observe puncture site for leakage or bleeding **(Abdelmowla et al., 2018).**

Significance of the study

It is widely accepted that lumbar puncture is a safe intervention, yet complications can occur. The most common complication is PLPH, which is an orthostatic headache caused by CSF leakage, usually starting within 48 hours of the lumbar puncture in 90% of patients. In 80% of patients, PLPH resolves within 7 days, but in a minority, it may persist for weeks or months. Back pain and nerve root irritation occur in 15% and 11% of lumbar punctures, respectively; Other rare complications include cerebral herniation (3–7%), bacterial meningitis (<0.1%), spinal hematoma (incidence unknown) and cerebral venous sinus thrombosis (incidence unknown).A possible complication, currently being investigated, is accelerated disc degeneration following penetration of the intervertebral disc joint during lumbar puncture **(Mishra, & Vishnu, 2020).**

The incidence of post lumbar puncture headache (PLPH) varies widely, depending on patient (eg, age, gender, pregnancy, body mass index (BMI]) and procedural (eg, needle size and type, bevel orientation for cutting needles) risk factors. The incidence of PLPH after spinal anesthesia is generally <3 percent, but may occur in up to 9 percent of cases, depending on the type and size of needle used. post lumbar puncture headache after lumbar puncture (LP) occurs in approximately 11 percent of cases when a standard, traumatic needle is used **(Brian et al.,2021).**

Aim of the study:

The current study aims to assess incidence of complications among patients undergoing lumbar puncture

Research Question:

1-What is the patients' level of knowledge regarding lumbar puncture complications?

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2-What are the factors contributing to post lumbar puncture complications?

3-What is the incidence level of complications regarding lumbar puncture?

Subjects and Methods:

Research design:

A descriptive exploratory research design was used to conduct this study.

Study Settings

The study was conducted at Zagazig university hospital (General surgery department, urology department, ortho department, ICU).

Sampling:

Purposive sample of 70 patients with post lumbar puncture and accept to participate in the study, through the following criteria:

Inclusion criteria

- ✓ Male and female patients
- ✓ Adult patients at any age

Exclusion criteria

- ✓ Patients with mental or psychological diseases

Tools of data collection:

Three tools was used in this study and classified as the following:

1st tool: Patient Structured Interview questionnaire:

It was designed by the investigator after reviewing related literature to collect the required data. It was written in simple Arabic language:

Part I: personal characteristics of patient such as age, gender, educational level, occupation, marital status. Total question (5).

Part II: Patients' medical and surgical history: Current and Previous medical History as (current medical diagnosis, suffer from any chronic diseases, The causes of the current lumbar puncture). Previous surgical history as (undergone surgery before, have you ever had a lumbar puncture, in case of yes how many times, when did you last do it)

Part III: Patients' knowledge assessment Questionnaire: It was be designed to assess patients' level of knowledge regarding lumbar puncture procedure as definition of lumbar puncture, its indications, and most common complications, characteristics of complications, different positions, their knowledge regarding caffeine and fluid intake before and after the procedure, reliving and aggravating factors. Total questions were (10). It was adapted from (**Abdelmowla et al. 2017).**

Scoring system:

The answers were formulated as Correct and incorrect the answer. One point was awarded for each correct answer and incorrect answer took zero. The total scores were 10 scores. The total knowledge scores were

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classified into satisfactory andunsatisfactory knowledge. Satisfactory if percent score was ≥ 60% or more. Unsatisfactory if the percent score is < 60%

Tool II: Complication assessment questionnaire: It was developed by the investigator after reviewing related literature as (**Johnson & Sexton, 2017)** and included eight items. It was used to assess complications for patients after lumbar puncture included time to rest and lie down, experienced pain, suffered a headache (severity and onset) when the bloody correction is done after the procedure of the lumbar thrombosis, Headache assessment questionnaire post the lumbar puncture procedure (16 items)

Tool III: Factors assessment questionnaire contributed to lumbar puncture complications: It was developed by the investigator after reviewing related literature as **(Ahmed et al. 2021)** and included nine questions divided to two sections:

Content, Validity:

The validity of the tool was tested through five experts from the Faculty of Nursing - Helwan University (3 experts in critical care nursing and 2 experts in medical and surgical nursing) to review the relevance of the tools for clarity, relevance, comprehensiveness, understanding, and applicability.

Reliability:

- Reliability analysis by measuring of internal consistency of the tool through Cronbach's Alpha test.

Items	Cronbach alpha
Patients' knowledge assessment	0.835 "good reliability"

Pilot study:

A Pilot study was carried out on 10% those represent (7) of patients post lumbar puncture to test the applicability, clarity, and the efficiency of the tools and then the tool was modified according to the result of pilot study. The pilot has also served to estimate the time needed for each subject to fill in the questionnaire. According to the results of the pilot, no corrections and omissions of items were performed, so the patients were included in the study sample.

Fieldwork

Data were collected through six months, from the beginning of July 2023 to the end of December 2023.

1. The investigator firstly met with the patients at the previously mentioned settings, explained the purpose of the study after introducing his self. Then, individual interviewing was done after obtaining patients consent to participate.
2. The investigator was visiting the study setting 3days / week (Saturday, Monday and Wednesday) at (9AM - 12PM).
3. The interview questionnaire was filled by investigator which takes 20-30 minutes.

Administrative Design

An official permission was obtained by submission of a formal letter issued from the Dean of faculty of nursing, Helwan University to the director of each of the previously mentioned setting. An official agreement was obtained from Hospital Manager and to get their approval to conduct the study. Collect the necessary data for current study after a brief explanation of the purpose of the study and its expected outcomes. Using proper channels of communication from authorized personnel

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Ethical Considerations

The research approval was obtained from the Ethics of Scientific Research Committee, Faculty of Nursing - Helwan University. The investigator was clarified the objectives and aim of the study to patients included in the study before starting. Oral consent was obtained from the patients before inclusion in the study; a clear and simple explanation was given according to their level of understanding. They secured that all the gathered data was confidential and used for research purpose only. The investigator was assuring maintaining anonymity and confidentiality of subjects' data included in the study.

Statistical Analysis:

Data collected from the studied sample was revised, coded and entered using Personal Computer (PC). Computerized data entry and statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 24. Data were presented using descriptive statistics in the form of frequencies, percentages. Chi-square test (X^2) was used for comparisons between qualitative variables. Spearman correlation measures the strength and direction of association between three ranked variables.

Significance of the results:

Highly significant at p-value < 0.01
Statistically significant was considered at p-value ≤ 0.05
Non-significant at p-value > 0.05

Results:

Table (1): Frequency and percentage distribution of the studied patients according to their personal data (n=70).

Personal data	N	%
Age		
<20	0	0
20-35	14	20.0
36-51	34	**48.6**
>51	22	31.4
$\bar{x}$ S.D 44.51±3.17		
Gender		
Male	51	72.9
Female	19	27.1
Occupation		
Daily worker	11	15.7
Government official	28	**40.0**
Private Sector Officer	23	**32.9**
Self-employment	8	11.4
Marital status		
Single	12	17.1
Married	50	**71.5**
Widower	1	1.4
Separated	7	10.0

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Table (1) shows that 48.6% of the studied patients ages ranged from 36-51 years; mean age was 44.51±3.17 years. Also, 72.9% of them were male. Regarding the patient occupation, it was found that 40.0% of them were government officials. while, 32.9% of them were private sector officers. Moreover, 71.5% of them were married.

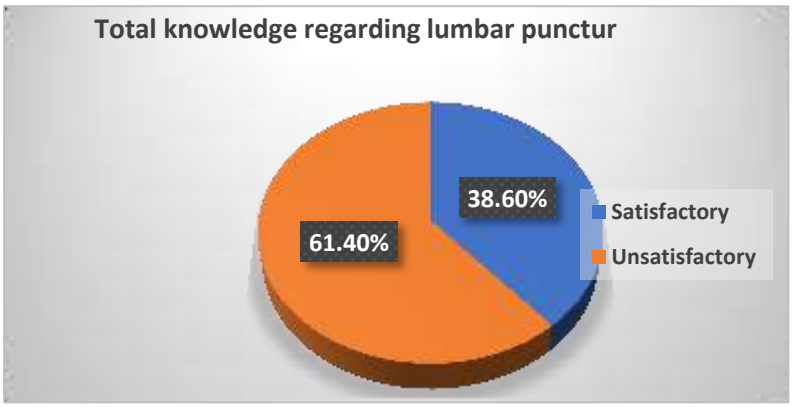

Figure (1): Percentage distribution of the studied patients according to their total knowledge regarding lumber puncture (n=70)

Figure (1): shows that 61.4% of the studied patients, according to their total knowledge regarding lumbar puncture, were unsatisfactory. While 38.6% of them were satisfactory.

Table (2): Frequency and percentage distribution of the studied patients according to complication assessment (n=70).

Items	N	%
Time it takes to rest and lie down after lumbar puncture		
<1 hour	26	37.1
1-3 hour	29	**41.5**
>3 hour	15	21.4
Have any complications after the lumbar puncture		
Yes	59	**84.3**
No	11	15.7
Have you experienced pain in the place of lumbar puncture		
No pain	0	0
Mild pain	8	11.4
Intermediate pain for several days	49	**70.0**
Severe pain	13	18.6
Suffered a headache as a result of the current lumbar puncture		
Yes	49	**70.0**
No	21	30.0
In case of yes, Headache severity n=49		
Light/simple	10	20.4
Medium	31	**63.3**
Severe	8	16.3

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Onset of headache n=49		
< 6 hours after lumbar puncture	3	6.1
6:24 hours after lumbar puncture	10	20.4
1:2 days after lumbar puncture	23	**47.0**
> 2 days after lumbar puncture	13	26.5

Table (2): displays that 41.5% of the studied patients, regarding complications, reported that the time it takes to rest and lie down after a lumbar puncture is 1-3 hours. While the majority of respondents (84.3%) have complications after the lumbar puncture, Furthermore, 70.0% and 70.0% of them experienced intermediate pain for several days in the place of a lumbar puncture and suffered a headache as a result of the current lumbar puncture, respectively. Moreover, 63.3% of them mentioned a medium headache. Additionally, 47.0% stated that onset of headaches began 1:2 days after the lumbar puncture.

Table (3): Frequency and percentage distribution of the studied patients according to headache assessment questionnaire related to the lumbar puncture procedure (n=70).

Items	**N**	**%**
Headache duration		
<1 day	22	31.4
1-3 days	38	**54.3**
>3 days	10	14.3
There are symptoms of cognitive disorders in previous senses		
Yes	11	15.7
No	59	**84.3**
If yes, choose from n=11		
Wavy lines	1	9.1
Points	0	0
Flashing light	3	27.3
Blind spots	2	18.2
Disturbance in a smile, taste, touch, other	5	**45.4**
Location of pain		
Front of the head	44	**62.9**
Front area in the head	12	17.1
The back of the head	4	5.7
Dissemination throughout the head	2	2.9
Impact of one side of the head	8	11.4
Type of pain		
Mild or constant pain with narrow tape such as pressure	15	21.4
Pulse or flickering	55	**78.6**
Pain intensity		
Moderate (1.3)	11	15.7
Average (4-6)	49	**70.0**
Severe (7-10)	10	14.3
Are there symptoms associated with headaches		
Yes	26	37.1

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No	44	62.9
If yes, choose from the following: **General symptoms associated with n=26**		
Nausea	7	26.9
Vomiting	2	7.7
radiating from the neck	13	50.0
Dizziness	4	15.4
Symptoms associated with the eye n=26		
Dual vision	2	7.7
Light phobia	0	0
None	24	92.3
Ear-accompanying symptoms n=26		
Tinnitus	10	38.5
Hearing loss	0	0
None	16	61.5

Table (3): shows that 54.3% of the studied patients had headaches lasting from 1-3 days. Also, the majority of respondents (84.3%) had not experienced symptoms of cognitive disorders in previous senses. While 45.4% of them experience disturbances in their smile, taste, and touch, Furthermore, 62.9% of them reported that the pain location was in the front of the head. Moreover, 78.6% of them mentioned that the pain was pulse or flickering. Additionally, more than two-thirds of them (70.0%) stated that the pain intensity was average.

Figure (2) Frequency and percentage distribution of the studied patients according to their onset of the headache (n=70).

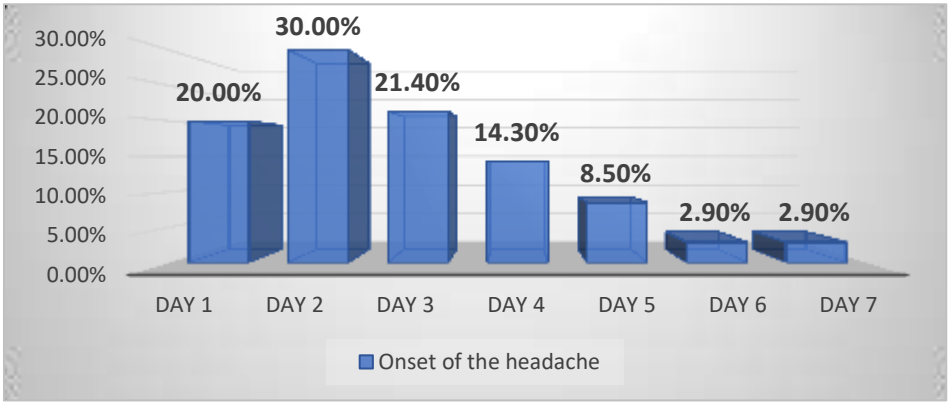

Figure (2) shows that 30.00% and 21.40% of the studied patients' onset of the headache was on days 2 and 3, respectively. Also, 20.00% and 14.30% of them were on days 1 and 4, respectively. Moreover, 8.50% and 2.90% of them mentioned in days 5 and 6.

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Table (4): Relationship between personal characteristics of studied patients and their total knowledge regarding lumbar puncture (n=70).

Items		Total knowledge				X^2	P-Value
		Satisfactory N=27		Unsatisfactory N=43			
		N	%	N	%		
Age	<20	0	0	0	0	5.257	.001**
	20-35	3	11.1	11	25.6		
	36-51	5	18.5	29	67.4		
	>51	19	70.4	3	7.0		
Gender	Male	23	85.2	28	65.1	5.104	.002**
	Female	4	14.8	15	34.9		
Level of education	Does not read or write	0	0	3	7.0	7.048	.000**
	Elementary	0	0	2	4.7		
	Preparatory	1	3.7	12	27.9		
	Medium	20	74.1	25	58.1		
	Universities	6	22.2	1	2.3		
Occupation	Daily worker	4	14.8	7	16.3	1.316	.053
	Governmental official	12	44.4	16	37.2		
	Private sector officer	8	29.7	15	34.9		
	Self-employment	3	11.1	5	11.6		
Marital status	Single	5	18.5	7	16.3	1.855	.081
	Married	20	74.1	30	69.8		
	Widower	0	0	1	2.3		
	Separated	2	7.4	5	11.6		

***Significant at p ‹0.05. **Highly significant at p ‹0.01. Not significant at p>0.05**

Table (4) reveals that, there were highly statistically significant relation between total knowledge regarding lumbar puncture of the studied patients and their socio-demographic data as age, gender and level of education in which X^2 = 5.257, 5.104 and 7.048 at (P= < 0.01). While, there were no statistically significant relation with their occupation and marital status in which X^2 = 1.316 and 1.855 at (P= > 0.05).

Table (5): Relationship between post lumbar puncture headache and factors related to subjects (n=70).

Items		Headache N=49		No headache N=21		X^2	P-Value
		N	%	N	%		
Experienced pain in the place of lumbar puncture	No pain	0	0	0	0	9.504	.005**
	Mild pain	6	12.2	2	9.5		
	Intermediate pain	30	61.2	19	90.5		
	Severe pain	13	26.6	0	0		
Number of attempts to insert lumbar puncture needle	Once	35	71.4	17	81.0	3.965	.035*
	Twice	13	26.6	3	14.3		
	(2-4)	1	2.0	1	4.7		
Total volume of CSF drawn	< 1 ml	0	0	2	9.5	8.174	.000**

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during lumbar puncture	1:3 ml	6	12.2	13	61.9		
	5:3 mL	18	36.8	6	28.6		
	> 5 mL	25	51.0	0	0		
Pain intensity	Moderate (1.3)	2	4.1	9	42.9	6.627	.003**
	Average (4-6)	37	75.5	12	57.1		
	Severe (7-10)	10	20.4	0	0		
Sleep hours after a headache occurs on the day	3-5 hours	6	12.2	3	14.3	4.146	.027*
	5-7 hours	15	30.6	2	9.5		
	7-9 hours	27	55.2	11	52.4		
	10-12 hours	1	2.0	3	14.3		
	> 12 hours	0	0	2	9.5		

***Significant at p ‹0.05. **Highly significant at p ‹0.01. Not significant at p>0.05**

Table (•) displays that, there were highly statistically significant relation between post lumbar puncture headache of the studied patients and factors related to subjects' data as experienced pain in the place of lumbar puncture, total volume of CSF drawn during lumbar puncture and pain intensity in which X2 = 9.504, 8.174 and 6.627 at (P= < 0.01). Also, there were statistically significant relation with their number of attempts to insert lumbar puncture needle and sleep hours after a headache occurs on the day in which X2=3.965 and 4.146 at (P= < 0.05).

Discussion:

The most frequent complication after lumbar puncture is headache. The variable incidence of PLPH is determined by several factors, including needle orientation and gauge, operator skills, and the existence of risk factors, such as PLPH history. Following LP, nurses should evaluate patient for any problems, recommend lying down for four hours, measure children's vital signs, encourage children to increase fluid intake if not contraindicated and check for leakage or bleeding at the puncture site (**Abd EL-Fatah, et al., 2023)**. Therefore, the aim of the current study to assess incidence of complications among patients undergoing lumbar puncture

In relation to personal characteristics, the results of the present study showed that nearly half of the studied patients' ages ranged from 36-51 years; their mean age was 44.51±3.17 years. This finding may be due to with increase age increases health problems and need to surgery. This This finding contradicted with **Ahmed et al. (2021)** entitled "patients' common associated symptoms, complications and knowledge post lumbar puncture" and reported that more than half of the studied patients had age range from 20 to 35 years.

From the investigator point of view the incidence of LP complication increased by increase age may be due to with increase age increases health problems and need to surgery.

Concerning gender of the studied sample, the present study illustrated that most of the studied patient had Lumbar Puncture were males. These results may due to one potential explanation could be that the underlying conditions necessitating a Lumbar Puncture, such as certain neurological disorders, infections, or spinal issues, might have a higher prevalence in males. This result matched with study done by **Portuguese et al. (2020)** entitled "safety of bedside lumbar puncture in adult patients with thrombocytopenia, and revealed that highest percentage of the studied patients were males. On other hand, this finding is disagreement with study by **Abdelmowla et al. (2017)** who conducted study about "lumbar puncture: nurses knowledge, practice and patients' satisfaction with nursing care" and showed that most of the studied patients had post lumbar puncture were females.

Concerning on total knowledge regarding lumbar puncture, the present study revealed that shows that less than two thirds of the studied patients were unsatisfactory. This finding may be due to the doctor and nurse

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hadn't give the patients enough instruction or information about indication of LP, patient position during LP procedure, possible complications after LP procedure, characteristic of PLPH, and its relieving and aggravating measures. Also, potential lack of communication between healthcare providers (doctors and nurses) and patients about the lumbar puncture (LP) procedure. In the same line, this finding supported with **Scotton et al. (2018)** who indicated in study titled "characterizing the patient experience of diagnostic lumbar puncture in idiopathic intracranial hypertension: a cross-sectional online survey" showed that the majority of studied subjects had inadequate knowledge about lumbar puncture.

From the investigator point of view the incidence of LP complication decreased by increasing the level of education may be due to patient who are higher education level follow up health team instruction.

Regarding complications, the present study illustrated that less than three quarters of the studied patients suffered from headache. This result may be due body position during procedure, needles and techniques used. The finding is consistent with the study of **Abdelmowla et al. (2017)** who conducted study about "lumbar puncture: nurses' knowledge, practice and patients' satisfaction with nursing care" and showed that most of the studied patients had post Lumbar Puncture suffered from headache.

Concerning on complications, the present study indicated that all and majority of the studied sample mentioned headache and backache as a complication This finding matched with **Ahmed et al. (2021)** who conducted study about "patients' common associated symptoms, complications and knowledge post lumbar puncture" and showed that most common complications among patients with lumbar puncture are post lumbar puncture site pain and headache. This finding not supported with result that was reported by **Duits et al. (2016)** who, mentioned in study titled "performance and complications of lumbar puncture in memory clinics: results of the multicenter lumbar puncture feasibility study" and reported that about third of patient complain of complications and nearly two thirds of those affected subjects had back ache or discomfort.

According to the findings of this study onset of the headache, the present study found that less than one third and less than one quarter of the studied patients' onset of the headache was on days 2 and 3, respectively. These finding may be due to post-lumbar puncture headaches (PLPH) tend to develop within the first few days following the procedure. This timing is consistent with the typical onset pattern of PLPH, which often manifests within 24 to 48 hours after the lumbar puncture. This finding is supported with study by **Weji et al. (2020)** entitled "incidence and risk factors of postdural puncture headache: prospective cohort study design" and found that about one quarter of the studied patients had post-lumbar puncture headache at second and third day of post procedural period. Conversely, this finding is disagreement **Yiangou et al., (2019)** entitled "therapeutic lumbar puncture for headache in idiopathic intracranial hypertension" and revealed that headache about three quarters of the studied patients reported that intensity improve in the short-term improvement in headache following CSF withdrawal (10–15 minutes)

Concerning relation between personal characteristics of studied patients and their total knowledge regarding lumbar puncture, the current study revealed that, there were highly statistically significant relation between total knowledge regarding lumbar puncture of the studied patients and their personal data as age, gender and level of education. From the investigator point of view, Patients with higher levels of education are more likely to comprehend complex medical information and may actively engage in learning about procedures like lumbar punctures. They might also have better access to educational resources, contributing to greater knowledge compared to those with lower levels of education. Also, younger patients may have better access to contemporary information sources like the internet and digital platforms, which could affect their knowledge levels. This finding in same line with study by **Aldayel et al. (2019)** who carried out study about "public knowledge and attitude toward lumbar puncture among adults in Riyadh, Saudi Arabia: a cross-sectional study" and represented that there was a significant association between older age and greater knowledge scores.

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Conversely, this finding disagreed with study by **Elafros et al. (2021)** who studied entitled "lumbar puncture-related knowledge, attitudes, and practices among patients, caregivers, doctors, and nurses in Zambia" and showed that there no statistically significant relation between total knowledge regarding lumbar puncture of the studied patients and their age and level of education.

With regards Relationship between post lumbar puncture headache and factors related to subjects, the present study showed that there were highly statistically significant relation between post lumbar puncture headache of the studied patients and factors related to subjects' data as age, suffer from any chronic diseases and have you ever had a lumbar puncture. Also, there were statistically significant relation with their medical diagnosis and time it takes to rest and lie down after LP.

These results may attributed to Patients suffering from chronic diseases may have compromised health, which could exacerbate their vulnerability to post-procedure complications, including PLPH. Conditions such as hypertension or diabetes can affect the body's healing processes and overall resilience. Individuals who have previously undergone a lumbar puncture might have an increased likelihood of developing PLPH due to previous exposure or complications related to the procedure, such as scar tissue or heightened sensitivity. Also, the underlying medical conditions for which the lumbar puncture is being performed may affect the occurrence of headaches.

This finding agreed with **Salzer et al. (2020)** whose study titled "prevention of post- dural puncture headache: a randomized controlled trial" and revealed that there was a significant relation between associated symptoms post LP and age of subjects. Also, this finding matched with **Ahmed et al. (2021)** who showed that there was statistically significant relation between post lumbar puncture headache of the studied patients and factors related to subjects' data as age, suffer from any chronic diseases and previous had a lumbar puncture.

The present study displayed that, there were highly statistically significant relation between post lumbar puncture headache of the studied patients and factors related to subjects' data as experienced pain in the place of lumbar puncture, total volume of CSF drawn during lumbar puncture and pain intensity. This finding may be due to the failure of the dural puncture site to close properly is hypothesized to produce PLPH, leading to CSF leaking and cerebral hypovolemia. This pulls on parts of the brain that are sensitive to pain, causing a headache.

This result in same line with study published by **Abd EL-Fatah et al. (2023)** entitled "effect of evidence-based guidelines on nurses' knowledge and practice regarding management of post lumbar puncture headache" and showed that there was significant relation between post lumbar puncture headache of the studied patients and pain intensity. Moreover, this result supported with **Engelborghs et al. (2017)** entitled "consensus guidelines for lumbar puncture in patients with neurological diseases" and showed that there was statistically significant relation between post lumbar puncture complications among the studied patients and the total volume of CSF drawn during lumbar puncture.

From the investigator point of view, this rationalized that, patients' knowledge effect on decreasing the incidence of lumber puncture complications. Also, nurses' knowledge, attitude and practice effect on decreasing LP complications.

Conclusion:

The results of the study indicate a significant gap in knowledge regarding lumbar puncture among patients, about two thirds of them displaying unsatisfactory levels of knowledge. The complication assessment revealed that majority of patients experienced complications post-procedure, with common issues including more than two thirds suffered from headaches and most of them suffered from back pain. the study also highlighted significant relationships between patient demographics and their knowledge and experience of post-lumbar puncture headaches.

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Recommendations:

Based on the findings of the study results, the following recommendations were advocated:

- Develop comprehensive educational booklet to inform patients about the lumbar puncture procedure, potential risks, and ways to manage post-procedure symptoms
- Establish standardized post-procedure care protocols, including recommended rest periods, hydration, and pain management strategies.
- Encourage ongoing research in lumbar puncture techniques and patient care.
- continuous professional training to update healthcare providers on the best practices and latest advancements in lumbar puncture techniques and patient care.

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