RESULTS

The present study composed of the following tabulated data which presented in tables (1-24) and included the following parts:

Part I. Socio-demographic characteristics of studied sample: Tables 1,2 & Figures 1-4.

Part II. Nurses' knowledge related to hydrocephalus in children : Tables 3-5.

Part III. Knowledge of studied nurses about infection control for children with shunted hydrocephalus: Tables 6-8.

Part IV. Nurses' practices related to hydrocephalus in children: Table 9-14.

Part V. Nurses' practices related to prevention of shunt infection in children with shunted hydrocephalus: Table 15-24.

Part I. Socio-demographic Characteristics of Studied Sample

Table (1): Socio-demographic characteristics of studied nurses (n=25)

Variables	Benha University Hospital (n=15)		Specialized Pediatric Hospital (n=10)		Total (n=25)		X^2 P
	No.	%	No.	%	No.	%	
▪Age (in years):							
20<25	3	20.0	1	10.0	4	16.0	6.875
25-35	6	40.0	9	90.0	15	60.0	0.011*
>35	6	40.0	0	0.0	6	24.0	
Range	21-40		30-33		21-40		
Mean± SD	31.20±7.28		31.40±1.17		31.28±5.61		
t-test	0.086						
P	0.933						
▪Education level:							
School of nursing	15	100.0	10	100.0	25	100.0	-
▪Years of experience:							
<3	2	13.3	0	0.0	2	8.0	6.481
3<5	1	6.7	0	0.0	1	4.0	0.090^{ns}
5<10	4	26.7	0	0.0	4	16.0	
10 +	8	53.3	10	100.0	18	72.0	
Range	4-21		11-14		4-21		
Mean± SD	13.07±6.34		12.40±1.17		12.80±4.97		
t-test	0.322						
P	0.750						
▪Received previous training sessions:							
No	15	100.0	10	100.0	25	100.0	-

ns (P> 0.05) ***(P< 0.05)**

Table 1 describes the socio-demographic characteristics of studied nurses. Their age ranged between 20 and >35 years old. As regards educational level, all of them (100%) had secondary nursing school. Most of the nurses (72%) had ten or more years of experience. As for receiving previous training sessions, all of them (100%) did not attended any training sessions.

Table (2): Distribution of studied children according to their biosocial characteristics (n=40)

Variables	Benha University Hospital (n=17)		Specialized Pediatric Hospital (n=23)		Total (n=40)		X^2 P
	No.	%	No.	%	No.	%	
▪**Age:**							
One day- one month	7	41.2	8	34.8	15	37.5	5.339
One month- one year	10	58.8	9	39.1	19	47.5	0.376^{ns}
One year- 2 years	0	0.0	1	4.3	1	2.5	
2 years- 3 years	0	0.0	1	4.3	1	2.5	
3 years- 4 years	0	0.0	2	8.7	2	5.0	
4 years- 5 years	0	0.0	2	8.7	2	5.0	
Range (months)	0.25-42		0.50-108		0.25-108		
Mean± SD	4.75±8.66		17.20±30.51		10.04±21.52		
▪**Sex:**							
Male	17	73.9	8	47.1	25	62.5	3.008
Female	6	26.1	9	52.9	15	37.5	0.083^{ns}
▪**Occurrence of shunt infection post-program**	2	11.8	3	13.0	5	12.5	0.13 0.717^{ns}

Table 2 presents the characteristics of studied children according to their biosocial characteristics. As obvious, more than one third of children were from one day to one month (37.5%) and from one month to one year (47.5%). Also, more than half of them were males (62.5%). Furthermore, five children acquired shunt infection within 6 months after program implementation.

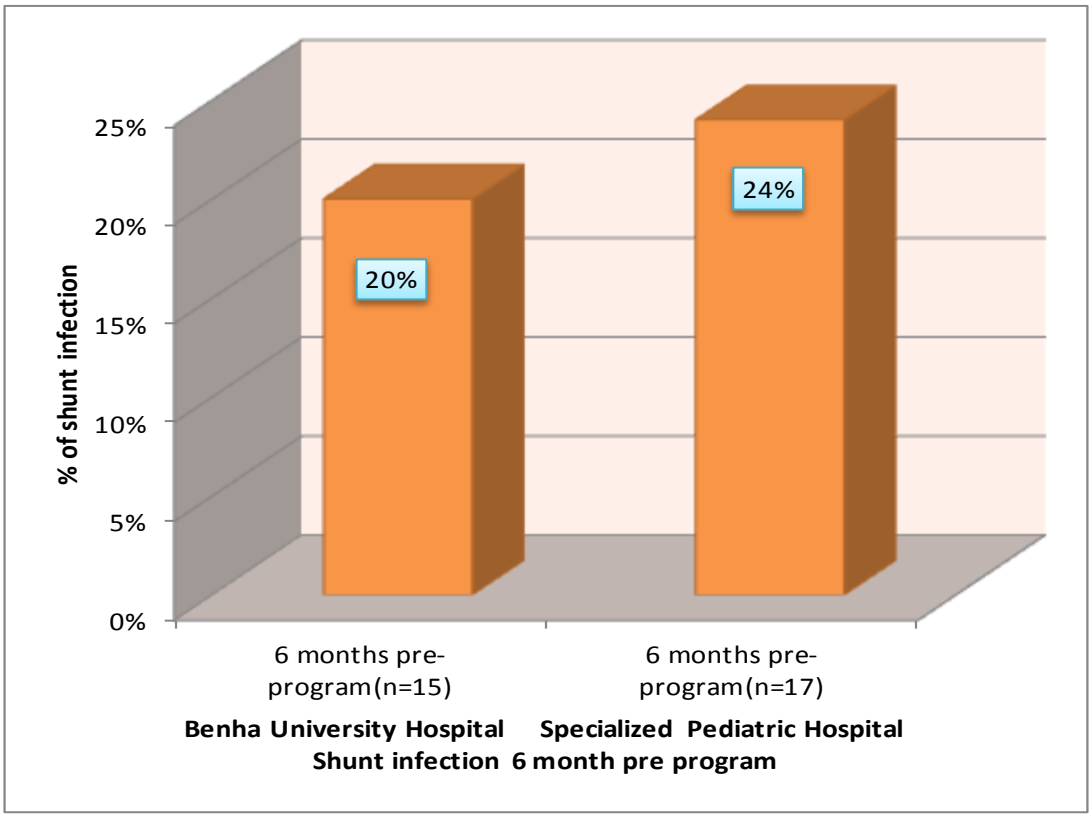

Figure (1): Frequency of shunt infection at Benha University Hospital and Specialized Pediatric Hospital in six months pre-program.

Figure 1 shows that (20%) of children had shunt infection in six months pre-program in Benha University Hospital and (24%) had shunt infection in six months pre-program in Specialized Pediatric Hospital.

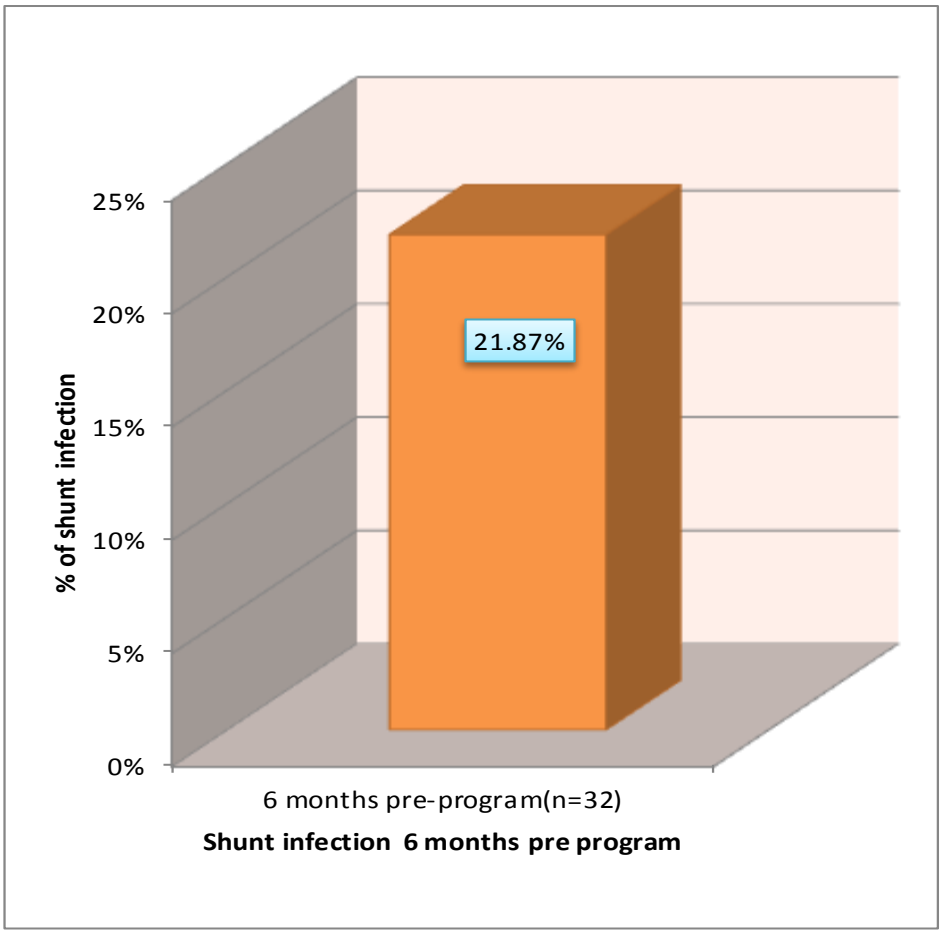

Figure (2): Frequency of shunt infection among the total children in six months pre-program.

Figure 2 shows that (21.87%) of children acquired shunt infection in six months pre-program.

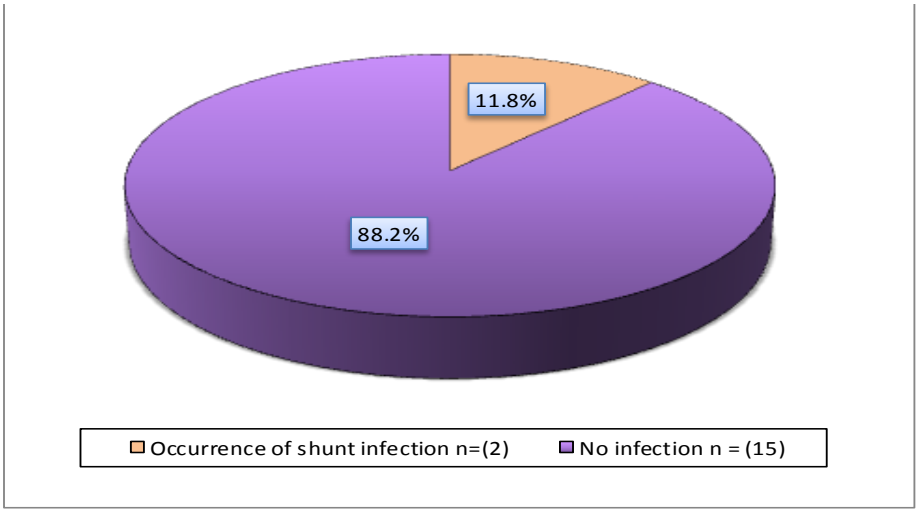

Figure (3): Prevalence of shunt infection among the studied children in Benha University Hospital (n=17)

Figure 3 clarifies that more than three quarters of studied children (88.2%) did not acquire shunt infection within six months post-program in Benha University Hospital.

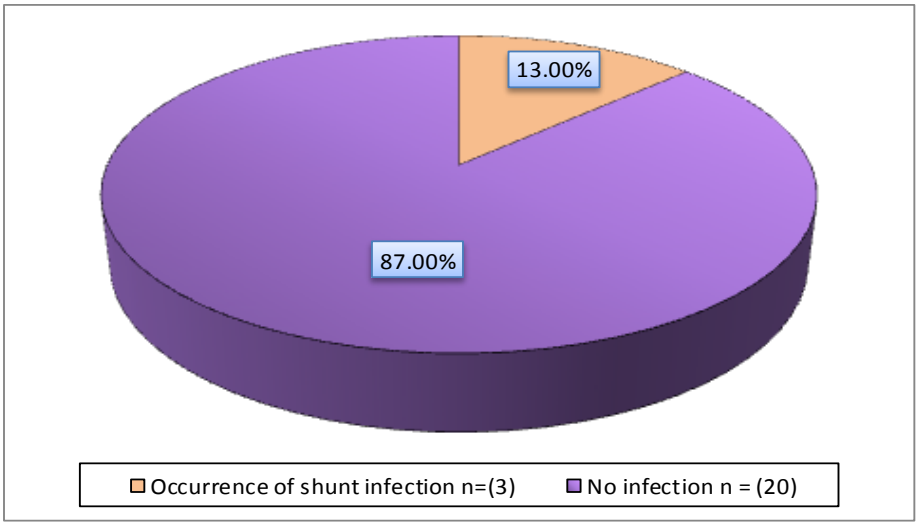

Figure (4): Prevalence of shunt infection among the studied children in Specialized Pediatric Hospital (n=23)

Figure 4 shows that more than three quarters of studied children (87%) did not acquire shunt infection within six months post-program in Specialized Pediatric Hospital.

Part II: Nurses' Knowledge related to hydrocephalus in children.

Table (3): Knowledge of studied nurses about hydrocephalus

Knowledge about Hydrocephalus	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post		Pre	Post
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Benha vs Spec. Ped.	
-Definition of hydrocephalus:																
-Inadequate	3	20.0	0	0.0	1.48	4	40.0	0	0.0	2.81	7	28.0	0	0.0	0.405	0.00
-Adequate	12	80.0	15	100	0.223^{ns}	6	60.0	10	100	0.093^{ns}	18	72.0	25	100	0.524^{ns}	1.000
-Causes of hydrocephalus In children:																
-Inadequate	10	66.7	2	13.3	6.81	8	80.0	2	20.0	5.00	18	72.0	4	16.0	0.074	0.01
-Adequate	5	33.3	13	86.7	0.009**	2	20.0	8	80.0	0.025*	7	28.0	21	84.0	0.785^{ns}	0.911^{ns}
-Signs & symptoms of hydrocephalus																
a-In infants (< 2 years):																
-Don't know	4	26.7	0	0.0	16.25	8	80.0	0	0.0	13.45	12	48.0	0	0.0	6.838	7.819
-Inadequate	11	73.3	5	33.3	0.0003**	2	20.0	7	70.0	0.001**	13	52.0	12	48.0	0.009**	0.005**
-Adequate	0	0.0	10	66.7		0	0.0	3	30.0		0	0.0	13	52.0		
b- **In children (≥ 2 years):**																
-Don't know	2	13.3	0	0.0	14.33	9	90.0	0	0.0	14.44	11	44.0	0	0.0	14.336	6.838
-Inadequate	12	80.0	4	26.7	0.0008**	1	10.0	6	60	0.001**	13	52.0	12	48.0	0.001**	0.009**
-Adequate	1	4.0	11	73.3		0	0.0	4	40.0		1	4.0	14	56.0		
-Management of hydrocephalus:																
-Don't know	2	13.3	0	0.0	0.54	2	20.0	0	0.0	10.21	4	16.0	0	0.0	11.111	0.00
-Adequate	13	86.7	15	100	0.464^{ns}	8	80.0	10	100	0.001**	21	84.0	25	100	0.001**	1.000

X^2_1 Comparison between pre and posttest.
X^2_2 Comparison between two pretests and posttests.
ns (P> 0.05) *(P< 0.05) **(P< 0.01) **(P< 0.001) **(P< 0.0001)

Table (4): Knowledge of studied nurses about complications of hydrocephalus

Knowledge items about Shunt Infection in Children with Shunted Hydrocephalus	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post		Pre	Post
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Benha vs Spec. Ped.	
-Signs and symptoms of shunt infection or malfunction:																
-Don't know	1	6.7	0	0.0	19.35	4	40.0	0	0.0	14.oo	5	20.0	0	0.0	4.561	0.01
-Inadequate	13	86.7	2	13.3	0.0001**	6	60.0	2	20.0	0.0009**	19	76.0	4	16.0	0.102^{ns}	0.911*
-Adequate	1	6.7	13	96.7		0	0	8	80.0		1	4.0	21	84.0		
-Signs and symptoms of excessive drainage (CSF):																
-Don't know	15	100	0	0.0	30,00	10	100	0	0.0	20.00	25	100	0	0.0	0.00	8.362
-Inadequate	0	0.0	2	13.3	0.0001**	0	0.0	7	70.0	0.0001**	0	0.0	9	36.0	1.000	0.004**
-Adequate	0	0.0	13	86.7		0	0.0	3	30.0		0	0.0	16	64.0		
-Signs and symptoms of increased intracranial pressure:																
a-In infants (<2 years)																
-Don't know	1	6.7	0	0.0	9.98	8	80.0	0	0.0	13.45	9	36.0	0	0.0	14.074	6.250
-Inadequate	13	86.7	6	40.0	0.006**	2	20.0	7	70.0	0.001**	15	60.0	13	52.0	0.001*	0.012*
-Adequate	1	6.7	9	60.0		0	0.0	3	30.0		1	1.0	12	48.0		
b-In children (≥2 years)																
-Don't know	6	40.0	0	0.0	12.06	8	80.0	0	0.0	14.67	14	56.0	0	0.0	5.159	4.167
-Inadequate	4	26.7	1	6.7	0.002**	2	20.0	4	40.0	0.001**	6	24.0	5	20.0	0.076^{ns}	0.041*
-Adequate	5	33.3	14	93.3		0	0.0	6	60.0		5	20.0	20	80.0		
-The potential nursing problems of hydrocephalic child:																
-Don't know	5	33.3	1	6.7	5.64	8	80.0	0	0.0	13.50	13	52.0	1	4.0	5.275	0.70
-Inadequate	6	40.0	4	26.7	0.060^{ns}	1	10.0	3	30.0	0.001**	7	28.0	7	28.0	0.072^{ns}	0.704^{ns}
-Adequate	4	26.7	10	66.7		1	10.0	7	70.0		5	20.0	17	68.0		

X^2_1 Comparison between pre and posttest.
X^2_2 Comparison between two pretests and posttests.
ns (P> 0.05) *(P< 0.05) **(P< 0.01) **(P< 0.001) **(P< 0.0001)

Table (5): Knowledge of studied nurses about nursing management of hydrocephalus

Knowledge about Shunt Infection	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post			
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Pre	Post
															Benha vs Spec. Ped.	
- Role of the nurse in pre-operative nursing care for child with Hydrocephalus:																
-Don't know	11	73.3	0	0.0	21.11	6	60.0	0	0.0	9.33	17	68.0	0	0.0	0.490	5.235
-Inadequate	4	26.7	5	33.3	0.0001**	4	40.0	7	70.0	0.009**	8	32.0	12	48.0	0.484^{ns}	0.022*
-Adequate	0	0	10	66.7		0	0.0	3	30.0		0	0.0	13	52.0		
-Role of the nurse in post-operative nursing care for child with hydrocephalus:																
-Don't know	10	66.7	0	0.0	30.00	9	90.0	0	0.0	18.00	19	76.0	0	0.0	1.791	1.563
-Inadequate	5	33.3	0	0.0	0.0001**	1	10.0	1	10.0	0.0001**	6	24.0	1	4.0	0.181^{ns}	0.211^{ns}
-Adequate	0	0.0	15	100		0	0.0	9	90.0		0	0.0	24	96.0		

X^2_1 Comparison between pre and posttest.
X^2_2 Comparison between two pretests and posttests.
ns (P>0.05) *(P<0.05) **(P<0.01) **(P<0.001) **(P<0.0001)

Part III: Knowledge of studied nurses about infection control for children with shunted hydrocephalus.

Table (6): Knowledge of studied nurses about prevention of surgical site infection

Knowledge items about Shunt Infection in Children with Shunted Hydrocephalus	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post		Pre	Post
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Benha vs Spec. Ped.	
-The role of nurse in prevention of transmission of infection pre-operation:																
-Don't know	4	26.7	0	0.0	23.60	4	40.0	0	0.0	10.40	8	32.0	0	0.0	2.381	0.01
-Inadequate	8	53.3	5	33.3	0.0001**	6	60.0	4	40.0	0.005**	14	56.0	9	36.0	0.304^{ns}	0.932*
-Adequate	3	20.0	10	66.7		0	0.0	6	60.0		3	12.0	16	64.0		
-The role of nurse in prevention of transmission of infection post-operation:																
-Don't know	6	40.0	0	0.0	12.40	7	70.0	0	0.0	20.00	13	52.0	0	0.0	5.34	0.77
-Inadequate	6	40.0	3	20.0	0.002**	3	30.0	0	0.0	0.0001**	9	36.0	3	12.0	0.069^{ns}	0.379^{ns}
-Adequate	3	20.0	12	80.0		0	0.0	10	100		3	12.0	22	88.0		

X^2_1 Comparison between pre and posttest.
X^2_2 Comparison between two pretests and posttests.
ns (P>0.05) *(P< 0.05) **(P< 0.01) **(P<0.001) **(P<0.0001)

Table (7): Knowledge of studied nurses about instrumental infection control precautions

Knowledge about shunt infection	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post		Pre	Post
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Benha vs Spec. Ped.	
- The way for prevention of transmission of infection by:																
a) medical thermometer:																
-Don't know	4	26.7	0	0.0	13.30	7	70.0	0	0.0	11.70	11	44.0	0	0.0	5.366	0.07
-Inadequate	10	66.7	5	33.3	0.001**	2	20.0	3	30.0	0.003**	12	48.0	8	32.0	0.068^{ns}	0.793^{ns}
-Adequate	1	6.7	10	66.7		1	10.0	7	70.0		2	8.0	17	68.0		
b) the syringes																
-Don't know	10	66.7	1	6.7	26.65	9	90.0	0	0.0	16.80	19	76.0	1	4.0	1.791	2.778
-Inadequate	5	33.3	2	13.3	0.0001**	1	10.0	4	40.0	0.0002**	6	24.0	6	24.0	0.181^{ns}	0.249^{ns}
-Adequate	0	0.0	12	80.0		0	0.0	6	60.0		0	0.0	18	72.0		
c) intravenous devices:																
-Don't know	1	6.7	1	6.7	11.63	5	50.0	1	10.0	7.78	6	24.0	2	8.0	7.205	2.66
-Inadequate	11	73.3	2	13.3	0.003**	5	50.0	4	40.0	0.020*	16	64.0	6	24.0	0.027^{*}	0.265^{ns}
-Adequate	3	20.0	12	80.0		0	0.0	5	50.0		3	12.0	17	68.0		
d) dressing forceps:																
-Don't know	9	60.0	0	0.0	20.57	7	70.0	0	0.0	20.00	16	64.0	0	0.0	0.781	0.20
-Inadequate	5	33.3	2	13.3	0.0001**	3	30.0	0	0.0	0.0001**	8	32.0	2	8.0	0.677^{ns}	0.652^{ns}
-Adequate	1	6.7	13	86.7		0	0.0	10	100		1	4.0	23	92.0		
e) bed linen:																
-Don't know	12	80.0	2	13.3	13.64	9	90.0	0	0.0	16.57	21	84.0	2	8.0	0.794	1.894
-Inadequate	2	13.3	5	33.3	0.001**	1	10.0	5	50.0	0.0002**	3	12.0	10	40.0	0.672^{ns}	0.388^{ns}
-Adequate	1	6.7	8	53.3		0	0.0	5	50.0		1	4.0	13	52.0		
f) baby feeding bottles:																
-Don't know	9	60.0	1	6.7	11.23	9	90.0	0	0.0	16.40	18	72.0	1	4.0	2.778	0.65
-Inadequate	5	33.3	6	40.0	0.004**	1	10.0	7	70.0	1.0003**	6	24.0	13	52.0	0.249^{ns}	0.722^{ns}
-Adequate	1	6.7	8	53.3		0	0.0	3	30.0		1	4.0	11	44.0		
g) baby eating utensils as: spoon, dish, etc.:																
-Don't know	2	13.3	0	0.0	4.20	0	0	0	0.0	2.81	2	8.0	0	0.0	3.17	0.17
-Inadequate	11	73.3	6	40.0	0.122^{ns}	10	100	4	40.0	0.093*	21	84.0	10	40.0	0.204*	1.677^{ns}
-Adequate	2	13.3	9	60.0		0	0.0	6	60.0		2	8.0	15	60.0		

X^2_1 Comparison between pre and posttest. X^2_2 Comparison between two pretests and posttests. **ns (P> 0.05) *(P< 0.05) **(P< 0.01) ** (P< 0.001) ** (P< 0.0001)**

Table (8): Knowledge of studied nurses about personnel infection control precautions and follow-up

Knowledge items about Shunt Infection in Children with Shunted Hydrocephalus	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post			
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Pre	Post
															Benha vs Spec. Ped.	
Infection control precautions																
-The role of nurse in prevention of transmission of infection from visitors to the child:																
-Don't know	10	66.7	0	0.0	23.07	8	80.0	0	0.0	17.33	18	72.0	0	0.0	0.93	0.20
-Inadequate	4	26.7	1	6.7	0.0001**	2	20.0	1	10.0	0.0001**	6	24.0	2	8.0	0.629^{ns}	0.562^{ns}
-Adequate	1	6.7	14	93.3		0	0.0	9	90.0		1	4.0	23	92.0		
-The nurse role in prevention of transmission of infection from child to child:																
-Don't know	3	20.0	0	0.0	13.70	8	80.0	0	0.0	16.36	11	44.0	0	0.0	13.70	0.20
-Inadequate	9	60.0	2	13.3	0.001**	1	10.0	0	0.0	0.0003**	10	40.0	2	8.0	0.001**	0.652^{ns}
-Adequate	3	20.0	13	86.7		1	10.0	10	100		4	16.0	23	92.0		
-The nurse role in prevention of transmission of infection from nurse to the child:																
-Don't know	11	73.3	0	0.0	20.33	9	90.0	0	0.0	17.00	20	80.0	0	0.0	1.597	1.00
-Inadequate	2	13.3	1	6.7	0.0001**	1	10.0	3	30.0	0.0002**	3	12.0	4	16.0	0.450^{ns}	0.316^{ns}
-Adequate	2	13.3	14	93.3		0	0.0	7	70.0		2	8.0	21	84.0		
Follow-up																
- It is necessary to follow up of the child in outpatient clinic after leaving the hospital:																
-Adequate	15	100	15	100	0.00	10	100	10	100	0.00	25	100	25	100	0.00	0.00
-The advices that the nurse give it to the parents after the child leave the hospital:																
-Don't know	0	0.0	1	6.7	19.35	8	80.0	0	0.0	15.20	8	32.0	1	4.0	17.778	2.92
-Inadequate	13	86.7	1	6.7	0.0001**	2	20.0	3	30.0	0.0005**	15	60.0	4	16.0	0.0001**	0.233^{ns}
-Adequate	2	13.3	13	86.7		0	0.0	7	70.0		2	8.0	20	80.0		

X^2_1 Comparison between pre and posttest.
X^2_2 Comparison between two pretests and posttests.
ns (P> 0.05) *(P< 0.05) **(P< 0.01) **(P< 0.001) **(P< 0.0001)

Part IV. Nurses' Practices related to hydrocephalus in children.

Table (9): Pre and post operative nursing care activities provided on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital

Main practice items	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post			
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Pre	Post
															Benha vs Spec. Ped.	
- Preoperative nursing care activities:																
-Not done	2	13.3	0	0.0	20.12	1	10.0	0	0.0	7.91	3	12.0	0	0.0	0.67	0.01
-Incompletely done	13	86.7	3	20.0	0.0001**	9	90.0	3	30.0	0.005**	22	88.0	6	24.0	0.414^{ns}	0.924*
-Completely done	0	0.0	12	80.0		0	0.0	7	70.0		0	0.0	19	76.0		
-Postoperative nursing care activities																
-Incompletely done	15	100	2	13.3	19.55	10	100	3	30.0	7.91	25	100	5	20.0	0.00	0.26
-Completely done	0	0.0	13	86.7	0.0001**	0	0.0	7	70.0	0.005**	0	0.0	20	80.0	1.000	0.610^{ns}

X^2_1 Comparison between pre and posttest.
X^2_2 Comparison between two pretests and posttests.
ns (P>0.05) *(P< 0.05) **(P< 0.01) **(P< 0.001) **(P< 0.0001)

Table (10): Hand washing procedure performed by studied nurses on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital

Steps of hand washing	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post		Pre	Post
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Benha vs Spec. Ped.	
- Wet hands and rub palms together.																
-Not done	13	86.7	0	0.0	30.00	9	90.0	0	0.0	20.00	22	88.0	0	0.0	0.14	0.00
-Incompletely done	2	13.3	0	0.0	0.0001**	1	10.0	0	0.0	0.0001**	3	12.0	0	0.0	0.706^{ns}	1.000
-Completely done	0	0.0	15	100		0	0.0	10	100		0	0.0	25	100		
- Rub back of both hands.																
-Not done	15	100	0	0.0	30.00	10	100	0	0.0	20.00	25	100	0	0.0	0.00	0.01
-Incompletely done	0	0.0	5	33.3	0.0001**	0	0.0	4	40.0	0.0001**	0	0.0	9	36.0	1.000	0.932^{ns}
-Completely done	0	0.0	10	66.7		0	0.0	6	60.0		0	0.0	16	64.0		
- Rub palms together with fingers interlaced.																
-Not done	15	100	1	6.7	26.25	10	100	2	20.0	13.33	25	100	3	12.0	0.00	1.23
-Incompletely done	0	0.0	7	46.7	0.0001**	0	0.0	3	30.0	0.001**	0	0.0	10	40.0	1.000	0.517^{ns}
-Completely done	0	0.0	7	46.7		0	0.0	5	50.0		0	0.0	12	48.0		
- Rub backs of fingers (interlocked).																
-Not done	15	100	3	20.0	20.00	10	100	1	10.0	16.36	25	100	4	16.0	0.00	2.52
-Incompletely done	0	0.0	3	20.0	0.0001**	0	0.0	5	50.0	0.0003**	0	0.0	8	32.0	1.000	0.283^{ns}
-Completely done	0	0.0	9	60.0		0	0.0	4	40.0		0	0.0	13	52.0		
- Rub both palms with finger tips.																
-Not done	15	100	0	0.0	26.13	10	100	0	0.0	20.00	25	100	0	0.0	0.00	1.563
-Incompletely done	0	0.0	0	0.0	0.0001**	0	0.0	1	10.0	0.0001**	0	0.0	1	4.0	1.000	0.211^{ns}
-Completely done	0	0.0	15	100		0	0.0	9	90.0		0	0.0	24	96.0		
- Rinse hands under running water.																
-Not done	13	86.7	0	0.0	30.00	9	90.0	0	0.0	20.00	22	88.0	0	0.0	0.14	0.00
- Incompletely done	2	13.3	0	0.0	0.001**	1	10.0	0	0.0	0.0001**	3	12.0	0	0.0	0.706^{ns}	1.000
-Completely done	0	0.0	15	100		0	0.0	10	100		0	0.0	25	100		
- Dry hands thoroughly with a clean towel.																
-Not done	15	100	0	0.0	26.13	10	100	0	0.0	16.20	25	100	0	0.0	0.00	0.00
-Incompletely done	0	0.0	0	0.0	0.0001**	0	0.0	0	0.0	0.0001**	0	0.0	0	0.0	1.000	1.000
-Completely done	0	0.0	15	100		0	0.0	10	100		0	0.0	25	100		

X^2_1 Comparison between pre and posttest. X^2_2 Comparison between two pretests and posttests. **ns (P>0.05) *(P< 0.05) **(P< 0.01) **(P< 0.001) **(P< 0.0001)**

Table (11): Gloving procedure followed by studied nurses on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital

Steps of sterile gloving technique (open method)	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post			
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Pre	Post
															Benha vs Spec. Ped.	
-Remove the outer wrapper from the package, placing the inner wrapper onto a clean, dry surface. Open inner wrapper to expose gloves.																
-Not done	15	100	0	0.0	26.13	10	100	0	0.0	16.20	25	100	0	0.0	0.00	0.00
-Completely done	0	0.0	15	100	0.0001**	0	0.0	10	100	0.0001**	0	0.0	25	100	1.000	1.000
-Identify right and left hand, glove dominant hand first.																
-Not done	15	100	1	6.7	30.00	10	100	0	0.0	16.20	25	100	1	4.0	0.00	0.694
-Completely done	0	0.0	14	93.3	0.0001**	0	0.0	10	100	0.0001**	0	0.0	24	96.0	1.000	0.405^{ns}
- Grasp the cuff with the thumb and first two fingers of the non- dominant hand, touching only the inside of the cuff.																
-Not done	15	100	0	0.0	30.00	10	100	0	0.0	20.00	25	100	0	0.0	0.00	0.07
-Incompletely done	0	0.0	4	26.7	0.0001**	0	0.0	4	40.0	0.0001**	0	0.0	8	32.0	1.000	0.793^{ns}
-Completely done	0	0.0	11	73.3		0	0.0	6	60.0		0	0.0	17	68.0		
- Gently pull the glove over the dominant hand, making sure the thumb and fingers fit into the proper spaces of the glove.																
-Not done	15	100	0	0.0	30.00	10	100	0	0.0	20.00	25	100	0	0.0	0.00	0.01
-Incompletely done	0	0.0	6	40.0	0.0001**	0	0.0	5	50.0	0.0001**	0	0.0	11	44.0	1.000	0.934^{ns}
-Completely done	0	0.0	9	60.0		0	0.0	5	50.0		0	0.0	14	56.0		
- With the gloved dominant hand, slip your fingers under the cuff of the other glove.																
-Not done	15	100	1	6.7	22.63	10	100	0	0.0	20.00	25	100	1	4.0	0.00	3.788
-Incompletely done	0	0.0	0	0.0	0.0001**	0	0.0	2	20.0	0.0001**	0	0.0	2	8.0	1.000	0.150^{ns}
-Completely done	0	0.0	14	93.3		0	0.0	8	80.0		0	0.0	22	88.0		
- Gently slip the glove onto your nondominant hand, making sure the fingers slip into the proper spaces.																
-Not done	15	100	0	0.0	25.00	10	100	0	0.0	20.00	25	100	0	0.0	0.00	0.26
-Incompletely done	0	0.0	2	13.3	0.0001**	0	0.0	3	30.0	0.0001**	0	0.0	5	20.0	1.000	0.610^{ns}
-Completely done	0	0.0	13	86.7		0	0.0	7	70.0		0	0.0	20	80.0		

X^2_1 Comparison between pre and posttest. X^2_2 Comparison between two pretests and posttests.

ns (P>0.05) *(P< 0.05) **(P< 0.01) **(P< 0.001) **(P< 0.0001)

Table (12): Nursing interventions followed by nurses on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital

Nursing interventions	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post			
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Pre	Post
															Benha vs Spec. Ped.	
-Steps of taking axillary temperature																
-Incompletely done	15	100	1	6.7	22.63	10	100	0	0.0	16.20	25	100	1	4.0	0.00	0.694
-Completely done	0	0.0	14	93.3	0.0001**	0	0.0	10	100	0.0001**	0	0.0	24	96.0	1.000	0.405^{ns}
-Steps of insertion of IV cannula:																
-Incompletely done	15	100	4	26.7	22.63	10	100	4	40.0	10.21	25	100	8	32.0	0.033	0.14
-Completely done	0	0.0	11	73.3	0.0001**	0	0.0	6	60.0	0.001**	0	0.0	17	68.0	1.856	0.706^{ns}
-Steps of administering IV medication:																
-Incompletely done	15	100	4	26.7	12.15	10	100	0	0.0	16.20	25	100	4	16.0	0.00	4.167
-Completely done	0	0.0	11	73.3	0.005**	0	0.0	10	100.0	0.0001**	0	0.0	21	84.0	1.000	0.041*
-Steps of wound care:																
-Incompletely done	15	100	1	6.7	22.63	9	90.0	1	10.0	9.80	24	96.0	2	8.0	1.563	0.00
-Completely done	0	0.0	14	93.3	0.0001**	1	10.0	9	90.0	0.002**	1	4.0	23	92.0	0.211^{ns}	1.000
-Steps of caring of fever:																
-Incompletely done	4	26.7	0	0.0	2.60	3	30.0	0	0.0	1.57	7	28.0	0	0.0	0.033	0.00
-Completely done	11	73.3	15	100	0.107^{ns}	7	70.0	10	100	0.210^{ns}	18	72.0	25	100	0.856^{ns}	1.000

X^2_1 Comparison between pre and posttest.
X^2_2 Comparison between two pretests and posttests.
ns (P>0.05) *(P< 0.05) **(P< 0.01) **(P< 0.001) **(P< 0.0001)

Table (13): Measuring head circumference procedure as performed by studied nurses on pre and posttests in Benha University Hospital and specialized Pediatric Hospital

Steps of measuring head circumference	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post		Pre	Post
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Benha vs Spec. Ped.	
- Explain procedure to child/caregiver																
-Not done	15	100	0	0.0	30.00	10	100	0	0.0	20.00	25	100	0	0.0	0.00	0.14
-Incompletely done	0	0.0	2	13.3	0.0001**	0	0.0	1	10.0	0.0001**	0	0.0	3	12.0	1.000	0.706^{ns}
-Completely done	0	0.0	13	86.7		0	0.0	9	90.0		0	0.0	22	88.0		
- Wash hands.																
-Not done	15	100	0	0.0	30.00	10	100	0	0.0	20.00	25	100	0	0.0	0.00	0.000
-Incompletely done	0	0.0	6	40.0	0.0001**	0	0.0	4	40.0	0.0001**	0	0.0	10	40.0	1.000	1.000
-Completely done	0	0.0	9	60.0		0	0.0	6	60.0		0	0.0	15	60.0		
- Using a tap measure, measure anteriorly from just above the eyebrows and around posteriorly to the occipital protuberance.																
-Not done	15	100	0	0.0	26.13	10	100	0	0.0	16.20	25	100	0	0.0	0.00	0.00
-Completely done	0	0.0	15	100	0.0001**	0	0.0	10	100	0.0001**	0	0.0	25	100	1.000	1.000
- Record the measurement.																
-Not done	15	100	0	0.0	26.13	10	100	0	0.0	16.20	25	100	0	0.0	0.00	0.00
-Completely done	0	0.0	15	100	0.0001**	0	0.0	10	100	0.0001**	0	0.0	25	100	1.000	1.000

X^2_1 Comparison between pre and posttest.
X^2_2 Comparison between two pretests and posttests.
ns (P>0.05) *(P< 0.05) **(P< 0.01) **(P< 0.001) **(P< 0.0001)

Table (14): Nurses' utilization of modified Glasgow coma scale for assessment of consciousness on pre and posttests in Benha University Hospital and specialized Pediatric Hospital

Assessment of consciousness	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post		Pre	Post
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Benha vs Spec. Ped.	
-Steps of Glasgow coma scale and score evaluation:																
A-Eye opening																
-Not done	1	6.7	0	0.0	0.00	9	90.0	0	0.0	12.93	10	40.0	0	0.0	17.361	0.00
-Completely done	14	93.3	15	100	1.000	1	10.0	10	100	0.0003**	15	60.0	25	100	0.0001**	1.000
B-Verbal response																
-Not done	1	6.7	0	0.0	7.35	9	90.0	0	0.0	0.00	10	40.0	0	0.0	0.00	1.103
-Incompletely done	14	93.3	1	6.7	0.007**	1	10.0	2	20.0	1.000	15	60.0	3	12.0	1.000	0.294^{ns}
-Completely done	0	0.0	14	93.3		0	0.0	8	80.0		0	0.0	22	88.0		
C-Motor response																
-Not done	1	6.7	0	0.0	6.84	9	90.0	0	0.0	16.44	10	40.0	0	0.0	17.917	0.146
-Incompletely done	10	66.7	4	26.7	0.033*	0	0.0	2	20.	0.0003**	10	40.0	6	24.0	0.0001**	0.702^{ns}
-Completely done	4	26.7	11	73.3		1	10.0	8	80.0		5	20.0	19	76.0		

X^2_1 Comparison between pre and posttest.
X^2_2 Comparison between two pretests and posttests.
ns (P>0.05) *(P< 0.05) **(P< 0.01) **(P< 0.001) **(P<0.0001)

Part V. Nurses' Practices related to prevention of shunt infection in children with shunted hydrocephalus.

Table (15): Pre operative infection control nursing interventions on pre and posttests for nurses in Benha University Hospital and Specialized Pediatric Hospital

Preoperative infection control interventions	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post		Pre	Post
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Benha vs Spec. Ped.	
-Preoperative infection control measures:																
A-Environment:																
-Not done	7	46.7	0	0.0	16.29	10	100	0	0.0	20.00	17	68.0	0	0.0	7.845	0.260
-Incompletely done	8	53.3	6	40.0	0.0003**	0	0.0	3	30.0	0.0001**	8	32.0	9	36.0	0.005**	0.610^{ns}
-Completely done	0	0.0	9	60.0		0	0.0	7	70.0		0	0.0	16	64.0		
B-Instruments																
-Incompletely done	15	100	4	26.7	14.35	10	100	2	0.0	16.20	25	100	6	24.0	0.00	3.175
-Completely done	0	0.0	11	73.3	0.0001**	0	0.0	8	80.0	0.0001**	0	0.0	19	76.0	1.000	0.075^{ns}

X^2_1 Comparison between pre and posttest.
X^2_2 Comparison between two pretests and posttests.
ns (P>0.05) *(P< 0.05) **(P< 0.01) **(P< 0.001) **(P<0.0001)

Table (16): Post operative infection control nursing interventions on pre and posttests for nurses in Benha University Hospital and Specialized Pediatric Hospital

Postoperative infection control interventions	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post		Pre	Post
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Benha vs Spec. Ped.	
-Postoperative infection control measures:																
A-Environment:																
-Not done	6	40.0	0	0.0	18.92	9	90.0	0	0.0	18.000	15	60.0	0	0.0	6.250	1.042
-Incompletely done	9	80.0	4	26.7	0.0001**	1	10.0	3	30.0	0.0001**	10	40.0	7	28.0	0.012*	0.307^{ns}
-Completely done	0	0.0	11	73.3		0	0.0	7	70.0		0	0.0	18	72.0		
B-Instruments:																
-Incompletely done	3	20.0	0	0.0	15.88	0	0	0	0.0	12.93	3	12.0	0	0.0	2.273	1.791
-Incompletely done	12	80.0	3	20.0	0.0003**	10	100	2	20.0	0.0003**	22	88.0	5	20.0	0.132^{ns}	0.181^{ns}
-Completely done	0	0.0	12	80.0		0	0.0	8	80.0		0	0.0	20	80.0		

X^2_1 Comparison between pre and posttest.
X^2_2 Comparison between two pretests and posttests.
ns (P>0.05) *(P< 0.05) **(P< 0.01) **(P< 0.001) **(P<0.0001)

Table (17): Pre operative nursing practices to prevent shunt infection in children on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital

Preoperative nurses practices	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post			
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Pre	Post
															Benha vs Spec. Ped.	
- Hand hygiene:																
a) Before and after patient contact.																
-Not done	15	100	0	0	30.00	10	100	0	0	20.00	25	100	0	0	0.00	0.14
-Incompletely done	0	0	1	6.7	0.0001**	0	0	2	20.0	0.0001**	0	0	3	12.0	1.000	0.706^{ns}
-Completely done	0	0	14	93.3		0	0	8	80.0		0	0	22	88.0		
b) After removal of gloves.																
-Not done	15	100	0	0	30.00	10	100	1	10.0	12.93	25	100	1	4.0	0.00	2.174
-Incompletely done	0	0	1	6.7	0.0001**	0	0	0	0	0.0003**	0	0	1	4.0	1.000	0.237^{ns}
-Completely done	0	0	14	93.3		0	0	9	90.0		0	0	23	92.0		
c) Remove jewelry before hand washing.																
-Not done	15	100	0	0	15.23	10	100	0	0	20.00	25	100	0	0	0.00	0.00
-Incompletely done	0	0	9	60.0	0.0005**	0	0	6	60.0	0.0001**	0	0	15	60.0	1.000	1.000
-Completely done	0	0	6	40.0		0	0	4	40.0		0	0	10	40.0		
d) Keep nails short.																
-Not done	14	93.3	0	0	28.00	10	100	0	0	16.20	24	96.0	0	0	0.694	0.04
-Incompletely done	1	6.7	1	6.7	0.0001**	0	0	0	0	0.0001**	1	4.0	1	4.0	0.405^{ns}	0.835^{ns}
-Completely done	0	0	14	93.3		0	0	10	100		0	0	24	96.0		
- Wear gloves before any procedures with the child:																
a) Wear a clean gloves for direct contact with blood or body fluids, non intact skin and mucous membrane.																
-Not done	4	26.7	0	0	30.00	0	0	0	0	5.95	4	16.0	0	0	5.175	7.143
-Incompletely done	11	73.3	0	0	0.0001**	10	100	4	40.0	0.015*	21	84.0	4	16.0	0.075^{ns}	0.008**
-Completely done	0	0	15	100		0	0	6	60.0		0	0	21	84.0		
b) Wear gloves and discard it between patients or contaminated body sites.																
-Not done	7	46.7	0	0	26.44	1	10.0	0	0	16.40	8	32.0	0	0	3.707	0.091
-Incompletely done	8	53.3	1	6.7	0.0001**	9	90.0	1	10.0	0.0003**	17	68.0	2	8.0	0.054^{ns}	0.763^{ns}
-Completely done	0	0	14	93.3		0	0	9	90.0		0	0	23	92.0		

X^2_1 Comparison between pre and posttest. X^2_2 Comparison between two pretests and post tests. **ns (P>0.05) *(P< 0.05) **(P< 0.01) **(P< 0.001) **(P<0.0001)**

Table (18): Post operative nursing practices to prevent shunt infection in children on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital

Postoperative nurses practices	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post		Pre	Post
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Benha vs Spec. Ped.	
- Hand hygiene:																
a) Before and after patient contact.																
-Not done	15	100	0	0.0	30.00	10	100	0	0.0	20.00	25	100	0	0.0	0.00	0.01
-Incompletely done	0	0.0	2	13.3	0.0001**	0	0.0	2	20.0	0.0001**	0	0.0	4	16.0	1.000	0.911^{ns}
-Completely done	0	0.0	13	86.0		0	0.0	8	80.0		0	0.0	21	84.0		
b) After removal of gloves.																
-Not done	15	100	0	0.0	30.00	10	100	1	10	12.93	25	100	1	4.0	0.00	3.174
-Incompletely done	0	0.0	1	6.7	0.0001**	0	0.0	0	0.0	0.0003**	0	0.0	1	4.0	1.000	0.337^{ns}
-Completely done	0	0.0	14	93.3		0	0.0	9	100		0	0.0	23	92.0		
c) Remove jewelry before hand washing.																
-Not done	15	100	0	0.0	30.00	10	100	1	10.0	12.93	25	100	1	4.0	0.00	3.571
-Incompletely done	0	0.0	3	20.0	0.0001**	0	0.0	0	0.0	0.0003**	0	0.0	3	12.0	1.000	0.168^{ns}
-Completely done	0	0.0	12	80.0		0	0.0	9	90.0		0	0.0	21	84.0		
d) Keep nails short.																
-Not done	14	93.3	0	0.0	28.00	10	100	0	0.0	16.20	24	96.0	0	0.0	0.694	0.694
-Incompletely done	1	6.7	1	6.7	0.0001**	0	0.0	0	0.0	0.0001**	1	4.0	1	4.0	0.405^{ns}	0.405^{ns}
-Completely done	0	0.0	14	93.3		0	0.0	10	100		0	0.0	24	96.0		
- Wear gloves before any procedures with the child:																
a) Wear a clean gloves for direct contact with blood or body fluids, non intact skin and mucous membrane.																
-Not done	4	26.7	0	0.0	30.00	1	10.0	0	0.0	16.40	5	20.0	0	0.0	1.042	1.563
-Incompletely done	11	73.3	0	0.0	0.0001**	9	90.0	1	10.0	0.0003**	20	80.0	1	4.0	0.307^{ns}	0.211^{ns}
-Completely done	0	0.0	15	100		0	0.0	9	90.0		0	0.0	24	96.0		
b) Wear gloves and discard it between patients or contaminated body sites.																
-Not done	6	40.0	0	0.0	30.00	1	10.0	0	0.0	16.40	7	28.0	0	0.0	2.679	1.563
-Incompletely done	9	60.0	0	0.0	0.0001**	9	90.0	1	10.0	0.0003**	18	72.0	1	4.0	0.102^{ns}	0.211^{ns}
-Completely done	0	0.0	15	100		0	0.0	9	90.0		0	0.0	24	96.0		

X^2_1 Comparison between pre and posttest. X^2_2 Comparison between two pretests and posttests. **ns (P>0.05) *(P< 0.05) **(P< 0.01) **(P< 0.001) **(P<0.0001)**

Table (19): Role of the nurse in pre operative preparation of patients on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital

Preoperative preparation of the patient	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post		Pre	Post
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Benha vs Spec. Ped.	
-Identify and treat all surgical site infection before operation.																
-Not done	15	100	0	0.0	30.00	8	80.0	0	0.0	15.20	23	92.0	0	0.0	3.261	0.26
-Incompletely done	0	0.0	2	13.3	0.0001**	2	20.0	3	30.0	0.0005**	2	8.0	5	20.0	0.071^{ns}	0.610^{ns}
-Completely done	0	0.0	13	86.7		0	0.0	7	70.0		0	0.0	20	80.0		
-Remove hair immediately before the operation preferably with electric clippers.																
-Not done	15	100	0	0.0	30.00	10	100	0	0.0	20.00	25	100	0	0.0	0.00	0.17
-Incompletely done	0	0.0	5	33.3	0.0001**	0	0.0	5	50.0	0.0001**	0	0.0	10	40.0	1.000	0.677*
-Completely done	0	0.0	10	66.7		0	0.0	5	50.0		0	0.0	15	60.0		
-Require child to bathe with an antiseptic agent on the night before the operation.																
-Incompletely done	14	93.3	0	0.0	22.63	10	100	1	10.0	12.93	24	96.0	1	4.0	0.694	1.563
-Completely done	1	6.7	15	100	0.0001**	0	0.0	9	90.0	0.0003**	1	4.0	24	96.0	0.405^{ns}	0.211^{ns}
-Thoroughly wash and clean at and around the incision site.																
-Not done	15	100	0	0.0	30.00	9	90.0	0	0.0	16.57	24	96.0	0	0.0	1.563	0.427
-Incompletely done	0	0.0	7	46.7	0.0001**	1	10.0	6	60.0	0.0002**	1	4.0	13	52.0	0.211^{ns}	0.513^{ns}
-Completely done	0	0.0	8	53.3		0	0.0	4	40.0		0	0.0	12	48.0		
- Apply preoperative antiseptic skin solution in a circular motion over the incision site.																
-Not done	13	86.7	0	0.0	23.45	10	100	0	0.0	20.00	23	92.0	0	0.0	1.449	0.01
-Incompletely done	2	13.3	9	60.0	0.0001**	0	0.0	5	50.0	0.0001**	2	8.0	14	56.0	0.229^{ns}	0.934*
-Completely done	0	0.0	6	40.0		0	0.0	5	50.0		0	0.0	11	44.0		

X^2_1 Comparison between pre and posttest. X^2_2 Comparison between two pretests and posttests.

ns (P>0.05) *(P< 0.05) **(P< 0.01) **(P< 0.001) **(P<0.0001)

Table (20): Role of the nurse in post operative period on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital

Postoperative nursing practices	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post		Pre	Post
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Benha vs Spec. Ped.	
- Protect surgical site with a sterile dressing postoperatively.																
-Incompletely done	3	20.0	0	0.0	1.48	0	0.0	0	0.0	0.00	3	12.0	0	0.0	2.273	0.00
-Completely done	12	80.00	15	100	0.223^{ns}	10	100	10	100	1.000	22	88.0	25	100	0.132^{ns}	1.000
- Wash hands before and after dressing changes and any contact with the surgical site.																
-Not done	5	33.3	0	0.0	30.00	2	20.0	0	0.0	165.44	7	28.0	0	0.0	0.529	0.04
-Incompletely done	10	66.7	0	0.0	0.0001**	8	80.0	1	10.0	0.0003**	18	72.0	1	4.0	0.467^{ns}	0.935^{ns}
-Completely done	0	0.0	15	100		0	0.0	9	90.0		0	0.0	24	96.0		
- Use sterile technique in changing incision dressing.																
-Incompletely done	15	100	0	0.0	26.13	10	100	1	10.0	12.93	25	100	1	4.0	0.00	0.04
-Completely done	0	0.0	15	100	0.0001**	0	0.0	9	90.0	0.0003**	0	0.0	24	96.0	1.000	0.935^{ns}
- Observe for possible signs and symptoms of infection at operative site.																
-Incompletely done	15	100	2	13.3	19.55	10	100	2	20.0	10.21	25	100	4	16.0	0.00	0.01
-Completely done	0	0.0	13	86.7	0.0001**	0	0.0	8	80.0	0.001**	0	0.0	21	84.0	1.000	0.911^{ns}
- Educate the family regarding proper incision care and symptoms of surgical site infection.																
-Not done	15	100	0	0.0	30.00	9	90.0	0	0.0	12.93	24	96.0	0	0.0	1.563	5.063
-Incompletely done	0	0.0	6	40.0	0.0001**	1	10.0	8	80.0	0.0003**	1	4.0	14	56.0	0.211^{ns}	0.022*
-Completely done	0	0.0	9	60.0		0	0.0	2	20.0		0	0.0	11	44.0		

X^2_1 Comparison between pre and posttest.
X^2_2 Comparison between two pretests and posttests.
ns (P>0.05) *(P< 0.05) **(P< 0.01) **(P< 0.001) **(P<0.0001)

Table (21): Role of the nurse on the follow-up phase on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital

Nurses Practices	Benha University Hospital (n=15)				X^2_1 P	Specialized Pediatric Hospital (n=10)				X^2_1 P	Total (n=25)				X^2_2 P	
	Pre		Post			Pre		Post			Pre		Post			
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	Pre	Post
															Benha vs Spec. Ped.	
-Follow up plan of care:																
A-Caring of shunt:																
-Not done	2	13.3	0	0.0	26.29	1	10.0	0	0.0	16.36	3	12.0	0	0.0	1.587	0.694
-Incompletely done	13	86.7	1	6.7	0.0001**	8	80.0	0	0.0	0.0003**	21	84.0	1	4.0	0.452^{ns}	0.405^{ns}
-Completely done	0	0.0	14	93.3		1	10.0	10	100		1	4.0	24	96.0		
B- Monitoring for signs and symptoms of shunt infection or malfunction																
-Not done	2	13.3	1	6.7	27.33	2	20.0	2	20.0	16.00	4	16.0	3	12.0	0.198	1.010
-Incompletely done	13	86.7	0	0.0	0.0001**	8	80.0	0	0.0	0.0003**	21	84.0	0	0.0	0.656^{ns}	0.315^{ns}
-Completely done	0	0.0	14	93.3		0	0.0	8	80.0		0	0.0	22	88.0		

X^2_1 Comparison between pre and posttest.
X^2_2 Comparison between two pretests and posttests.
ns (P>0.05) *(P< 0.05) **(P< 0.01) **(P< 0.001) **(P<0.0001)

Table 3 shows knowledge of studied nurses about hydrocephalus. It indicated that the majority of nurses in the two settings had adequate knowledge about definition and management of hydrocephalus (72%), (84%) on pretest. On the other hand, more than two thirds of nurses (72%) had inadequate knowledge about causes and more than half of them (52%) had inadequate knowledge about signs and symptoms of hydrocephalus in infants < 2 years and children ≥ 2 years (52%) on pretest.

On posttest, nurses had better knowledge about hydrocephalus (definition 100%, causes 84.0%, signs and symptoms < 2 years 52%, ≥ 2 years 56% and management 100%) than on pretest. For this reason, there were statistical significant differences between knowledge of nurses on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital at 5% and 1% levels of statistical significance.

Although there were no statistical significant differences between the total knowledge of nurses at the two selected settings except on pre and posttest in relation to signs and symptoms of hydrocephalus ($P<0.01$). Furthermore, there was a highly statistical significant difference between total nurses knowledge about management of hydrocephalus on pretest ($P<0.01$) as nurses in Benha University Hospital had better knowledge than nurses in Specialized Pediatric Hospital.

Table 4 shows knowledge of studied nurses about complications of hydrocephalus. It indicated that approximately three quarters of nurses in the two settings (76%) had inadequate knowledge about signs and symptoms of shunt infection or malfunction and signs and symptoms of increased intracranial pressure in infants < 2 years (60%) on pretest. On the other hand, all nurses (100%) had no knowledge about signs and symptoms of excessive drainage on pretest and more than half of nurses (56%) had no knowledge about signs and symptoms of increased intracranial pressure in children ≥ 2 years and the potential nursing problems of hydrocephalic child (52%).

On posttest, nurses had better knowledge about complications of hydrocephalus (signs and symptoms of shunt infection 84%, signs and symptoms of excessive drainage 64%, signs and symptoms of increased intracranial pressure in infants < 2 years 48%, ≥ 2 years 80% and the potential nursing problems of hydrocephalic child 68%) in the two selected hospitals.

There were statistical significant differences between knowledge of nurses on pre and posttest in both hospitals except for the potential nursing problems of hydrocephalic child. Also, there were statistical significant differences between the total knowledge of nurses in the two selected hospitals on pre and posttests at 5% and 1% levels of statistical significant differences except for the potential nursing problems of hydrocephalic child.

Table 5 shows knowledge of studied nurses about nursing management of hydrocephalus. In relation to the total knowledge, the majority of nurses in the two settings had no knowledge about role of the nurse in providing pre and post operative nursing care for child with hydrocephalus (68%), (76%) on pretest. In the two hospitals nurses had better knowledge about role of the nurse in providing pre and post operative nursing care (52%), (96%) on posttest.

Therefore, there were highly statistical significant differences on pre and posttests at 1% level of statistical significance. Also, there was a statistical significant difference between total knowledge of studied nurses about role of the nurse in pre operative nursing care for child with hydrocephalus on posttest at 5% level of statistical significance.

Table 6 shows knowledge of studied nurses about prevention of surgical site infection. It indicated that more than half of nurses in two settings (56%) had inadequate knowledge about the role of nurse in the prevention of transmission of infection at preoperative period. Moreover, more than half of nurses (52%) had no knowledge about the prevention of transmission of infection at postoperative period on pretest. On posttest, nurses had more adequate knowledge about the prevention of transmission of infection on preoperative period (64%) and prevention of transmission of infection at postoperative period (88%).

However, there were statistical significant differences between nurses knowledge on pre and posttests in the two selected hospitals at 1% level of statistical significance. Also, there was a statistical significant difference between total knowledge of nurses about prevention of transmission of infection on preoperative phase on posttest at 5% level of statistical significance.

Table 7 shows knowledge of studied nurses about instrumental infection control precautions. It indicated that the majority of nurses had inadequate knowledge about the way for prevention of transmission of infection by medical thermometer (48%), intravenous devices (64%) and baby eating utensils as spoon, dish, etc. (84%) on pretest. Besides, more than two thirds of nurses had no knowledge about the way for prevention of transmission of infection by the syringes (76%), dressing forceps (64%), bed linen (84%) and baby feeding bottles (72%) on pretest.

On posttest, nurses had better knowledge about instrumental infection control precautions such as prevention of transmission of infection by medical thermometer (68%), the syringes (72%), intravenous devices (68%), dressing forceps (92%), bed linen (52%), baby feeding bottles (44%) and baby eating utensils as spoon, dish, etc. (60%).

For this reason, there were statistical significant differences between knowledge of nurses on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital at 5% and 1% levels of statistical significance. On the other hand, there were no statistical significant differences between total knowledge of nurses about infection control precautions on posttest at 5% level of statistical significance.

Table 8 shows knowledge of studied nurses about personnel infection control precautions and follow-up. It indicated that the majority of nurses had no knowledge about the role of nurse in prevention of transmission of infection from visitors to the child (72%), from child to child (44%) and from nurse to the child (80%) on pretest. On the other hand, all nurses in the two settings (100%) had adequate knowledge about the necessary follow-up, and more than half of nurses (60%) had inadequate knowledge about advices that the nurse should provide to the parents after the child leaves the hospital.

On posttest, nurses had more adequate knowledge about the role of nurse in prevention of transmission of infection from visitors to the child (92%), from child to child (92%), from nurse to the child (84%) and the advices that the nurse give it to the parents after the child leaves the hospital (80%).

Although there were statistical significant differences between knowledge of nurses on pre and posttests at 1% level of statistical significance in each hospital, no statistical significant differences were found between total knowledge of nurses about personnel infection control precautions and follow-up on posttest at 5% level of statistical significance.

Table 9 shows pre and post operative nursing care activities provided on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital. It indicated that more than three quarters of nurses (88%) had incompletely done pre operative nursing care activities on pretest. Furtheremore, all of them (100%) had incompletely done post operative nursing care activities on pretest.

On posttest, more than three quarters of nurses had completely done pre oprative nursing care activities (76%) and post operative nursing care activities (80%). Above all, there was only a statistical significant difference at 5% level of statistical significance between total level of nurses' practices in relation to pre operative nursing care activities on posttest at 5% level of statistical significance.

Table 10 shows hand washing procedure performed by studied nurses on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital. It indicated that more than three quarters of nurses (88%) did not wet hands, rub palms together and rinse hands under running water on pretest. Besides, all nurses (100%) did not rub the back of both hands, rub palms together with fingers interlaced, rub backs of fingers (interlocked), rub both palms with finger tips and dry hands thoroughly with a clean towel on pretest.

On posttest, all nurses (100%) completely wet hands and rubbed palms together, rinsed hands under running water and dried hands thoroughly with a clean towel. Besides, approximately two thirds of nurses (64%) completely rubbed the back of both hands. More than one third of nurses (48%) completely rubbed palms together with fingers interlaced. More than half of nurses (52%) completely rubbed backs of fingers (interlocked). Moreover, the majority of nurses (96%) completely rubbed both palms with finger tips on posttest.

In each hospital, there were statistical significant differences between nurses' hand washing practices on pretest and posttest at 1% level of statistical significance. Above all, on statistical significant differences were found between total nurses' practices on pretest and posttest at 5% level of statistical significance.

Table 11 shows gloving procedure followed by studied nurses on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital. It indicated that all nurses (100%) did not practise any step of sterile gloving technique on pretest. On posttest, all nurses (100%) completely removed the outer wrapper from the package, placed the inner wrapper onto a clean, dry surface and opened the inner wrapper to expose gloves. The table also indicated that the majority of nurses (96%) had completely identified right and left gloves, gloved dominant hand at first.

Also, (88%) of nurses slipped fingers under the cuff of the other glove with gloved dominant hand, about (80%) of studied nurses made sure the fingers slip into the proper spaces. More than two thirds of nurses (68%) had completely grasped the cuff with the thumb and first two fingers of the nondominant hand and touched only the inside of the cuff. More than half of nurses (56%) had completely and gently pulled the glove over the dominant hand and made sure the thumb and fingers fit into the proper spaces of the glove.

Although there were statistical significant differences between nurses' gloving technique practice on pre and posttests in the two hospitals at 1% level of statistical significance, no statistical significant differences were found between total nurses practices on pre and posttests at 5% level of statistical significance.

Table 12 shows nursing interventions followed by studied nurses on pre and posttest in Benha University Hospital and Specialized Pediatric Hospital. It indicated that all nurses (100%) incompletely took axillary temperature, performed the steps of insertion of IV cannula (100%), administered IV medication (100%) and performed wound care (96%). Also, more than two thirds of nurses (72%) had completely provided fever care on pretest. On posttest, approximately all nurses (96%) completely took axillary temperature, administered IV medication (84%), provided wound care (92%) and provided fever care (100%). Besides, approximately two thirds of nurses (68%) had completely performed steps of insertion of IV cannula.

Although there were highly statistical significant differences between nurses' performance on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital at 1% level of statistical significance except for caring of fever, there were no statistical significant differences between the total nurses' performance on pre and posttests at 5% level of statistical significance except for administrating IV medication on posttest.

Table 13 shows measuring head circumference procedure as performed by studied nurses on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital. It indicated that all nurses (100%) did not practise any step of measuring head circumference on pretest. On posttest, more than three quarters of nurses (88%) had completely explained procedure to child/caregiver and approximately two thirds of nurses (60%) had completely practised hand washing. Besides, all nurses (100%) had completely utilized tap measurement, measured anteriorly from just above the eyebrows and around posteriorly to the occipital protuberance and recorded the measurement.

Therefore, there were statistical significant differences between nurses' practices on pre and posttests in each hospital (Benha and Specialized Pediatrics) at 1% level of statistical significance. Meanwhile, no statistical significant differences were found between total nurses' practices on pretest and total nurses' practices on posttest at 5% level of statistical significance.

Table 14 shows nurses' utilization of modified Glassgow coma scale for the assessment of consciousness on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital. It indicated that approximately two thirds of nurses (60%) had completely assessed eye opening, two thirds of nurses (60%) had incompletely assessed verbal response and more than one third of nurses (40%) had incompletely assessed motor response on pretest. On posttest, all nurses (100%) had completely assessed eye opening and more than three quarters of nurses (88%) had completely assessed verbal response and motor response (76%).

In other word, there were highly statistical significant differences between nurses' practices on pre and posttests in each hospital. As well, there were statistical significant differences between total nurses' practices on pretests at 1% level of statistical significance. Meanwhile, there were no statistical significant differences between total nurses' practices on posttest at 5% level of statistical significance.

Table 15 shows pre operative infection control nursing interventions on pre and posttests for nurses in Benha University Hospital and Specialized Pediatric Hospital. It indicated that approximately two thirds of nurses (68%) did not follow pre operative environmental infection control measures, all nurses (100%) incompletely used pre operative infection control measures for instruments on pretest. On posttest, approximately two thirds of nurses (64%) completely followed pre operative infection control measures for the environment and more than two thirds of nurses (76%) completely followed pre operative instrumental infection control measures.

Therefore, there were highly statistical significant differences ($P<0.0001\%$) between nursing interventions on pre and posttest in each hospital. Also, there was a highly statistical significant difference between total nurses performance on pretest (environmental infection control) at 1% level of statistical significance. On the other hand, there were no statistical significant differences between nurses performances either on pretest (instrumental care) or on posttest (environmental and instrumental care) at 5% level of statistical significance.

Table 16 shows postoperative infection control nursing interventions on pre and posttests for nurses in Benha University Hospital and Specialized Pediatric Hospital. It indicated that approximately two thirds of nurses (60%) did not follow post operative infection control measures for the environment. More than three quarters of nurses (88%) had incompletely done post operative infection control measures for instruments on pretest. On posttest, more than two thirds of nurses (72%) had completely followed post operative infection control measures for the environment and instruments (80%).

Therefore, there were statistical significant differences between post operative infection control measures on pre and posttests in each hospital at 1% level of statistical significance. On the other hand, no statistical significant differences were found between total nurses practices on pre or posttests at 5% level of statistical significance except for environmental post operative infection control ($P< 0.05$) on pretest.

Table 17 shows pre operative nursing practices to prevent shunt infection in children on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital. It indicated that all nurses (100%) did not perform hand hygiene before or after patient's contact, after removal of gloves and remove jewelry before hand washing. Approximately, all nurses (96%) did not cut their nails. Besides, more than three quarters of nurses (84%) incompletely wore a clean gloves for direct contact with blood, body fluids, non intact skin and mucous membrane. About two thirds of nurses (68%) incompletely wore and discarded gloves between patients or contaminated body sites on pretest.

On posttest, the majority of nurses (88%, 92%, 96%, 84% and 92%) had completely performed hand hygiene before and after patient contact, after removal of gloves, kept nails short, wore a clean gloves for direct contact with blood, body fluids, non intact skin and mucous membrane, wore gloves and discarded them between patients or contaminated body sites.

For this reason, there were highly statistical significant differences between nurses' practices on pre or posttests in each hospital at 1% level of statistical significance. Above all, there were no statistical significant differences between total nurses' practices on pre and posttest at 5% level of statistical significance except for wearing a clean gloves for direct contact with blood, body fluids, non intact skin and mucous membrane on posttest.

Table 18 shows post operative nursing practices to prevent shunt infection in children on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital. It indicated that all nurses (100%) did not perform hand hygiene before and after patient contact, after removal of gloves and remove jewelry before hand washing. The majority of nurses (96%) did not keep their nails short. Besides, approximately more than three quarters of nurses (80%) incompletely wore a clean gloves for direct contact with blood, body fluids, non intact skin and mucous membrane and wore gloves and discarded them between patients or contaminated body sites (72%) on pretest.

On posttest, the majority of nurses (84%) had completely performed hand hygiene before and after patient's contact, after removal of gloves (92%), removed jewelry before hand washing (84%), kept nails short (96%), wore a clean gloves for direct contact with blood or body fluids, non intact skin and mucous membrane (96%), wore gloves and discarded them between patients or managing contaminated body sites (96%).

For this reason, there were highly statistical significant differences between nurses' practices on pre or posttests in each hospital at 1% level of statistical significance. Above all, there were no statistical significant differences between total nurses' practices on pre or posttest at 5% level of statistical significance.

Table 19 shows role of the nurse in pre operative preparation of patients on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital. It indicated that approximately all nurses (92%, 100%, 96%, 92%) did not identify and treat all surgical site infection before operation, remove hair immediately before the operation preferably with electric clippers, thoroughly wash and clean incision site or apply pre operative antiseptic skin solution in a circular motion over the incision site on pretest.

On posttest, the majority of nurses (80%) had completely identified and treated all surgical site infection before operation and required the child to bathe with an antiseptic agent on the night before operation (96%), approximately two thirds of nurses (60%) had completely removed hair immediately before the operation preferably with electric clippers, more than one third of nurses (48%) had completely washed and cleaned incision site and applied preoperative antiseptic skin solution (44%).

For this reason, there were highly statistical significant differences between nurses' practices on pre or posttests in each hospital at 1% level of statistical significance. Above all, there were no statistical significant differences between total nurses' practices on pre or posttest at 5% level of statistical significance except for removing hair before operation and applying preoperative antiseptic skin solution on posttest ($P > 0.05$).

Table 20 shows role of the nurse in post operative period on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital. It indicated that the majority of nurses (72%, 100%, 100%) incompletely washed hands before and after changing dressing, used sterile technique in changing incision dressing and observed for possible signs and symptoms of operative site infection on pretest.

On posttest, approximately all nurses (100%, 96%, 96%, 84%) had completely protected surgical site with a sterile dressing post operatively, washed hands before and after dressing changes and any contact with the surgical site, used sterile technique in changing incision dressing and observed for possible signs and symptoms of operative site infection.

For this reason, there were highly statistical significant differences between nurses' practices on pre or posttests in each hospital at 1% level of statistical significance except for protecting surgical site with a sterile dressing postoperatively. Above all, there were no statistical significant differences between total nurses' practices on pre or posttest at 5% level of statistical significance except for educating the family regarding proper incision care and symptoms of surgical site infection on posttest.

Table 21 shows role of the nurse on the follow-up phase on pre and posttests in Benha University Hospital and Specialized Pediatric Hospital. It indicated that more than three quarters of nurses (84%) incompletely provided care of shunt and monitored for signs and sympoms of shunt infection or malfunction (84%) on pretest. On posttest, the majority of nurses (96%) had completely provided care of shunt and monitored for signs and symptoms of shunt infection or malfunction (88%).

For this reason, there were highly statistical significant differences between nurses' practices on pre or posttests in each hospital at 1% level of statistical significance. Above all, there were no statistical significant differences between total nurses' practices on pre or posttest at 5% level of statistical significance.

Table (22): Comparison between knowledge and practices of studied nurses about shunt infection on pre and post program implementation in Benha University Hospital and Specialized Pediatric Hospital

Knowledge and practices of nurses		Benha University Hospital (n=15)		Specialized Pediatric Hospital (n=10)		Total (n=25)		X^2_1	P
		No.	%	No.	%	No.	%		
Knowledge									
Don't know	Pre	14	93.3	10	100.0	24	96.0	0.04	0.835
	Post	0	0.0	0	0.0	0	0.0	0.01	0.924
Inadequate	Pre	1	6.7	0	0.0	1	4.0		
	Post	3	20.0	3	30.0	6	24.0		
Adequate	Pre	0	0.0	0	0.0	0	0.0		
	Post	12	80.0	7	70.0	19	76.0		
X^2_2 P (Pre vs Post)		27.00 0.0001**		20.00 0.0001**		46.57 0.0001**			
Practice									
Not done	Pre	13	86.7	9	90.0	22	88.0	0.14	0.07
	Post	0	0.0	0	0.0	0	0.0	0.706	0.785
Incompletely done	Pre	2	13.3	1	10.0	3	12.0		
	Post	4	26.7	3	30.0	7	28.0		
Completely done	Pre	0	0.0	0	0.0	0	0.0		
	Post	11	73.3	7	70.0	18	72.0		
X^2_2 P (Pre vs Post)		24.67 0.0001**		17.00 0.0002**		41.60 0.0001**			

X^2_1 Comparison between nurse' knowledge and practices in the two selected settings
X^2_2 Comparison between nurses' knowledge and practices on pre and posttests
ns (P> 0.05) ****(P< 0.0001)**

Table 22 presents comparison between knowledge and practices of studied nurses about shunt infection on pre and post program implementation in Benha University Hospital and Specialized Pediatric Hospital. As for nurses' knowledge, the table shows that approximately all nurses (96%) had no knowledge about shunt infection on pretest. After the implementation of the program, approximately three quarters of nurses (76%) had adequate knowledge about shunt infection on post test. Although there were no statistical significant differences between total knowledge of nurses in the two studied hospitals on post test (P>0.05), there were highly statistical significant differences between nurses' knowledge on pre test and post test in the two studied hospitals (P<0.0001).

In relation to nurses' practices, the majority of nurses (86.7% in Benha University Hospital and 90% in Specialized Pediatric Hospital) did not follow infection control rules in their nursing practice on pretest. After the implementation of the program, more than two thirds (72%) of nurses completely followed infection control rules in their nursing practice. Therefore, there were highly statistical significant differences between nurses' practices on pre and post test (p <.0001) in the two studied hospitals although there were no statistical significant differences between total nurses practices at the two selected settings on pre and post tests (P = 0.14 and 0.07).

Table (23): Total knowledge and practices of studied nurses about shunt infection in children with shunted hydrocephalus pre and posttest

Total knowledge and practices of nurses	The studied nurses (n=25)			
	Pre test		Post test	
	No.	%	No.	%
Total Knowledge				
Don't know	24	96.0	0	0.0
Inadequate	1	4.0	6	24.0
Adequate	0	0.0	19	76.0
X^2_2	46.57			
P	0.0001**			
Total Practices				
Not done	22	88.0	0	0.0
Incompletely done	3	12.0	7	28.0
Completely done	0	0.0	18	72.0
X^2_2	41.60			
P	0.0001**			

X^2_1 Comparison between nurses' knowledge and practices in the two selected settings
X^2_2 Comparison between nurses' knowledge and practices on pre and posttests
****(P< 0.0001)**

Table 23 presents total knowledge and practices of studied nurses about shunt infection in children with shunted hydrocephalus on pre and post test. As for total nurses knowledge, the table shows that approximately all nurses (96%) had no knowledge about shunt infection on pretest. After the implementation of the program, approximately three quarters of nurses (76%) had adequate knowledge about shunt infection on post test. Therefore, a statistical significant difference was found between nurses' knowledge on pretest and posttest at 1% level of statistical significance.

In relation to nurses' practices, the majority of nurses (88%) did not follow infection control rules in their nursing practice on pretest. On posttest, more than two thirds (72%) of nurses completely followed infection control rules in their nursing practice. Therefore, there were highly statistical significant differences between nurses' practices on pre and post test (P< 0.0001).

Table (24): Correlation between knowledge and practices of studied nurses about shunt infection.

parameter	Knowledge	
	R	P
Practices	0.00	1.000**

Table 24 shows a positive statistical correlation was found between total knowledge and practices of studied nurses at 1% level of statistical significance.