

Nurses' knowledge and practices towards children with glucose-6 phosphate dehydrogenase deficiency

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Abstract

Background: glucose-6 phosphatedehydrogenase deficiency is widely recognized as the prevailing human genetic disorder on a global scale, affecting approximately less than 400 million individuals who possess a mutation leading to the deficiency of this enzyme. This condition is predominantly prevalent in tropical and subtropical regions. **Aim:** Assess Nurses' knowledge and practices towards children with glucose-6-phosphate dehydrogenase deficiency. **Study design:** A descriptive research design was utilized in the present study. **Setting:** This study was conducted at the therapeutic unit of Minia Regional Blood Transfusion Center, Maser Elhora Hospital, Minia University Hospital for Obstetrics and Pediatrics. **Subject:** A convenient sample includes 65 nurses working at the selected sitting. **Tools:** Two tools were utilized in this study; the **first was an interviewing structured questionnaire sheet containing** two parts: **Part I:** demographic characteristics of the studied nurses. **Part II:** Nurses' knowledge questionnaire and the **second tool** was the nurses' practice checklist regarding caring for children with G6PD. **Results:** Over one-third of the nurses had good knowledge, and more than half of nurses had satisfactory practice for caring for children with G6PD deficiency. Also, more than half of them had unsatisfactory practice related to health education and the majority of them didn't practice physical assessment on admission. There is no correlation between the total score of studied nurses' knowledge and practice. **Conclusion:** More than one-third of nurses had good knowledge about G6PD deficiency, and satisfactory practices. **Recommendations:** The role of the nurse regarding the care of children with G6PD deficiency is very important, so nursing education and in-service training programs regarding G6PD among children should be done and equipped with the necessary educational facilities and materials necessary to upgrade the knowledge and skills of the nurse regarding the care of children with G6PD.

Keywords: Children, Glucose-6 phosphate dehydrogenase deficiency, Knowledge, Nurses, Practices

Introduction

Glucose-6-phosphate dehydrogenase deficiency (G6PD) is a hereditary condition that primarily affects males. The G6PD gene encodes the Glucose-6-phosphate dehydrogenase enzyme. This enzyme plays a role in the regular metabolism of carbohydrates. Additionally, it safeguards red blood cells against the detrimental impact of reactive oxygen species, which are potentially harmful molecules (Garcia et al., 2021).

G6PD deficiency is a genetic disorder caused by a change or mutation in the G6PD gene found at the far end of the long arm of the X chromosome. Due to its X-linked nature, the disorder is more prevalent in males. Nevertheless, heterozygous females have a higher frequency in terms of genotype. Males are more frequently affected by the genetic mutation, as heterozygous females are unlikely to experience complete deficiency due to favorable X-chromosome inactivation. The occurrence of homozygous female genotypes is exceptionally uncommon (Delfavero et al., 2020).

Consequently, accumulating reactive oxygen species can lead to impaired red blood cells. Elevating the concentration of reactive oxygen species accelerates the degradation of red blood cells beyond the rate at which the body can regenerate them. Hemolysis is characterized by intermittent episodes that resolve on their own. However, it is worth noting that many children experience persistent hemolysis without any oxidative triggers (Pal et al., 2019).

Hemolysis ensues exposure to drugs or other substances that generate peroxide, leading to the oxidation of

hemoglobin and red blood cell (RBC) membranes. The drugs and substances encompass primaquine, salicylates, sulfonamides, nitrofurans, phenacetin, naphthalene, certain vitamin K derivatives, dapsone, phenazopyridine, nalidixic acid, methylene blue, and, in certain instances, fava beans (Varghese et al., 2021).

The diagnosis relies on obtaining the family history, particularly when considering the possibility of a genetic disease. Physical examination findings, such as an enlarged spleen (splenomegaly), pale conjunctiva, and a rapid and forceful heartbeat (hyperkinetic apical pulse), can assist in making a diagnosis. Additional tests that can aid in diagnosis include a complete blood count, with a specific focus on red blood cell count and hemoglobin levels, liver enzyme tests, particularly bilirubin levels, urine hemoglobin measurement, haptoglobin level assessment, lactate dehydrogenase (LDH) test, methemoglobin reduction test, and reticulocyte count (Roper et al., 2020).

Managing G6PD deficiency involves the avoidance of drugs and foods that can trigger hemolysis. Additionally, vaccination against common pathogens such as hepatitis A and B is a crucial preventive measure for individuals with G6PD deficiency. Blood transfusions are essential during the acute phase of hemolysis. In cases of acute renal failure, dialysis may also be required. Blood transfusion is a crucial symptomatic intervention because the transfused red cells are typically not deficient in G6PD and will function normally in the recipient's bloodstream. Splenectomy may be advantageous in certain pediatric cases where the spleen is a significant site for the breakdown of red blood cells. It is

recommended to administer folic acid in these instances (Hussen et al., 2021).

Nurses play a crucial role in the community by offering health education programs to parents on the topic of favism, as well as providing guidance on how to manage their children's G6PD deficiency, which can be life-threatening. It is recommended that parents administer the new medication to their child and take precautions to prevent exposure to triggers that can cause hemolytic anemia (Rezaie et al., 2021).

It is crucial to evaluate nurses' understanding of caring for children with glucose-6-phosphate deficiency, the protocols to be implemented in the event of exposure to an oxidant and preventing shock, as well as their familiarity with the early symptoms of shock, knowledge of medications that may induce seizures, and awareness of the child's medical history and existing deficiency. Glucose hexa-phosphate dehydrogenase (Shokr et al., 2022).

Significance of the study: -

Glucose-6-phosphate dehydrogenase (G6PD) deficiency is a prevalent genetic enzyme deficiency that results in hemolytic anemia, impacting over 500 million individuals globally (Vick, 2020). The World Health Organization (WHO) recommends that the prevalence of G6PD deficiency in males is 3- 5% or higher (Lauden et al., 2019).

A cross-sectional study was conducted on 487 neonates of Egyptian ethnicity who had indirect hyperbilirubinemia between June 2018 and July 2019. The study found that 10.1% of the total sample had G6PD deficiency. The prevalence of G6PD deficiency is highest among children between the ages of 1 and 5 who have the Mediterranean variant of G6PD deficiency (Kasemy et al., 2020).

The incidence of G6PD deficiency in Egypt has been documented to range from 4% to 9.9%, which is comparatively higher than in certain other Mediterranean countries. Hemolytic anemia is the primary health complication linked to G6PD deficiency. It manifests as an accelerated heart rate, difficulty breathing, the presence of hemoglobin in urine, and, in severe instances, kidney failure. This condition can be life threatening for certain children and may result in fatalities (Eid et al., 2019).

Children diagnosed with G6PD deficiency require specialized nursing care to mitigate potential complications, including potentially fatal acute episodes of hemolysis (Gad et al., 2020). Moreover, the findings of this study could be beneficial for healthcare professionals, particularly nurses, in devising and executing nursing care protocols for similar cohorts of children in the future.

Aim of the Study

The current study aimed to assess Nurses' knowledge and practices towards children with glucose-6-phosphate dehydrogenase deficiency.

Research Questions

- What are the levels of nurses' knowledge and practices toward children with glucose-6-phosphate dehydrogenase deficiency?
- Is there a relation between nurses' knowledge and practices toward children with glucose-6-phosphate dehydrogenase deficiency?

- Is there a relation between nurses' knowledge and practices toward children with glucose-6-phosphate dehydrogenase deficiency and their demographic characteristics?

Research Design

A descriptive research design was utilized in this study.

Setting:

The study was carried out in the therapeutic unit of the Minia Regional Blood Transfusion Center in Minia City. This unit is situated on the third floor and has 12 beds. Maser Elhora Hospital is associated with the Ministry of Health and Population in two departments: The Pediatric Intensive Care Unit (PICU) on the second floor with seven beds and the Minia University Hospital for Obstetrics and Pediatrics (MUHOP) on the fourth floor with 21 beds.

Study sample:

The convenient sample consists of 65 nurses who work at specific locations: the therapeutic unit of the Minia Regional Blood Transfusion Center in Minia City (34), the PICU of Maser Elhora Hospital (19), and the pediatric hematology and oncology unit of the obstetric and pediatric university hospital (12).

Data Collection Tools:

Two tools were used for data collection as the following:

Part (I): Demographic characteristics of the studied nurses: - it consisted of 8 questions) such as age, residence, educational level, years of experience, years of work experience in the current area, training courses, place of work, and gender

Part (II): Nurses' knowledge questionnaire: It included 41 questions which developed by the researcher to assess the care of children with G6PD, such as the components of blood, the normal value of blood components (hemoglobin, white blood cells, red blood cells, and platelets) in different stages of growth from newborn to adolescence, function and role of (red blood cells, platelet, plasma, and the types & function of white blood cells), definition of G6PD, definition of G6PD deficiency, risk factors, gender difference, race, causes, triggers, food avoided for children with G6PD deficiency, best food, drugs, symptoms, diagnosis, management complications and prevention.

Knowledge Scoring System: -

The total number of questions was 41; each scored on a scale of 0 to 2. A score of 0 indicated a lack of knowledge or an incorrect answer; a score of 1 indicated an incomplete correct answer; and a score of 2 indicated a completely correct answer. The scores were aggregated and transformed into a percentage score. It was categorized into three classifications: poor proficiency (less than 50%). Fair level (between 50% and 75%) good level ($\geq 75\%$: 100%) (Gad El-Bastwese et al., 2020)

Tool (II): - Nurses practice checklist: to assess the practices of the nurses, which was adopted from Kalia (2015) and includes assessment on the admission checklist. It contains stems; the blood sample checklist contains 23 items; the blood transfusion checklist contains 22 items; the oxygen therapy

checklist contains 24 items; and the education for parents' checklist contains ten items.

Practices Scoring system:

The questionnaire used by the nurses consisted of closed-ended questions. It was categorized as either done or not done. A score of one was assigned to "done," and a score of zero was assigned to not done. Based on the nurses' feedback, the performance levels were classified as follows: A score of 70% or higher was deemed satisfactory, while a score below 70% was considered unsatisfactory. (El-Shanshory & Farag, 2019).

Validity of the tools:

A panel of five experts in the field of pediatric nursing revised the data collection tools to assess their face and content validity. The study tools were modified based on the panel's assessment of sentence clarity, content appropriateness, and item sequence. A panel of five experts in the field of pediatric nursing revised the data collection tools to assess their face and content validity. The study tools were modified based on the panel's assessment of sentence clarity, item sequence, and content appropriateness. The outcome of this modification yielded a score of 94%.

Reliability of Tools: -

The internal reliability of all items in the tools was evaluated using Cronbach's coefficient alpha. The structured interview questionnaire yielded a score of 0.7, while the interpreter- interobserver technique was used to measure the staff nurses' knowledge of G6PD deficiency and equivalence using tool II.

Pilot study:

The study was conducted on a sample of seven nurses, representing 10% of the total sample. The pilot study aimed to assess the feasibility and relevance of the instruments used and determine the time required to complete them. No alterations were deemed necessary. Consequently, the pilot study was incorporated into the overall sample.

Data collection procedure: -

Data collection was conducted over eight months, from the beginning of June 2022 to the end of December 2022. Administrative approval was obtained from the Dean of the Faculty of Nursing to the managers of Minia Regional Blood Transfusion Center, Maser Elhora Hospital, which is affiliated with the Ministry of Health and Population, and Minia University Hospital for Obstetrics and Pediatrics (MUHOP)

Results

Table 1: - Demographic characteristics of staff nurses (n=65)

Demographic characteristics	No. (n=65)	%
Age		
< 30 years	49	75.4
30<40	13	20.0
40<50	2	3.1
≥50 and more	1	1.5
Residence		
Urban	35	53.8
Rural	30	46.2
Level of education		
Nursing diploma	30	46.2
Bachelor of Nursing	31	47.7
Post graduate Studies	4	6.1
Years of experience		
< 5 years	45	69.2

- Before the implementation of the study, A clear and simple explanation of the aim and nature of the study was discussed by the researcher with the manager of the previously mentioned center to gain his cooperation and to allow a meeting with the nurses and then with the staff nurses.
- The oral consent was taken from each nurse after a complete description of the aim of the current study.
- The researcher was available two days weekly from 9 am to 12 pm by rotation at each study setting.
- During the morning shift, the researcher met with the nurses and introduced herself. She provided a comprehensive overview of the study, including its objectives. The researcher remained with the nurses until they completed the sheet and clarified any unclear items.
- Regarding the practice check list, the researcher observed the nurses three times in performing each procedure, and then the higher practice checklist score was chosen by the researcher for the nurses.
- The researcher was wearing protective face masks and kept a proper physical distance between the researcher and the nurses during data collection; the researcher observed the nurses during the care of children with G6PD and recorded the practice on the observational checklist.

Ethical Consideration: -

The research ethical committee of the faculty of nursing at Minia University granted initial approval. All nurses provided their informal consent to participate in the study. The researcher explained the study's purpose and nature to the participants through direct personal communication before they began participating. The data above was classified as confidential and exclusively utilized for research purposes.

Statistical Design:

The data was gathered, computerized, investigated, and summarized utilizing descriptive statistical analyses to evaluate research inquiries using SPSS version 26 (e.g., frequency, percentage (%)). The qualitative data were represented in terms of frequency and percentage. Probability, also known as the P-value, represents the likelihood of an event occurring. A significance level of less than was deemed statistically significant. A smaller P-value indicates a more significant result. P-values below 0.001 are considered highly significant

Demographic characteristics	No. (n=65)	%
5 – 10 years	14	21.5
>10 years	6	9.3
years of work experience in the current area		
< 5 years	53	81.5
5 – 10 years	7	10.8
>10 years	5	7.7
Training courses		
No	46	70.8
Yes	19	29.2
If yes, mention the number of courses.		
1-3 courses	15	79
3-5 courses	2	10.5
>5 courses	2	10.5
Place of work		
Pediatric Intensive Care Unit (PICU) in Maser Elhora hospital	19	29.2
therapeutic unit in Minia Regional Blood Transfusion Center in Minia City	34	52.3
pediatric hematology and oncology unit in obstetric and pediatric university hospital	12	18.5
Gender		
Male	23	35.4
Female	42	64.6

Table (1): observed that three-quarters of them (75.4%) were aged <30 yrs., while more than half of them (53.8%) were coming from the urban area. As for the level of education, nearly half of them (47.7%) had a nursing bachelor's degree, as well as 69.2% of them had experience in the nursing field < 5 years, and 81.5% of them their years of experience in their current area < 5 years, 70.8% didn't have a previous training course, and more than half of them (52.3%) worked in the therapeutic unit in Minia Regional Blood Transfusion Center in Minia city. Finally, 64.6% of them were female nurses.

Table (2): Percentage of the total score of nurses' knowledge related to the care of the child with G6PD deficiency

Total score of nurses' knowledge	No.	%
poor level <50%	17	26.2
fair level 50%	24	36.9
good level 75%	24	36.9

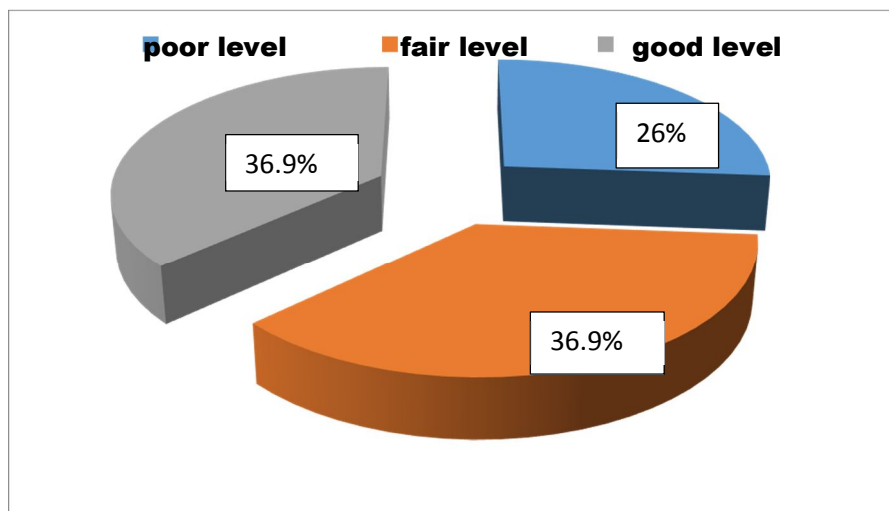


Figure (1): Percentage total score of nurses' knowledge about G6PD deficiency N=65

Table (2) & Figure (1) found that more than one-quarter of them had poor knowledge, while 36.9% had fair and good knowledge about G6PD deficiency

Table (3): Percentage score of nurses' performance related to the care of the child with G6PD deficiency

Nurses' performance	No. (n= 65)	Percent
Assessment of admission		
Unsatisfactory	62	95.4
Satisfactory	3	4.6
Drawing blood sample		
Unsatisfactory	2	3.1
Satisfactory	63	96.9
Blood transfusion		
Unsatisfactory	4	6.2
Satisfactory	61	93.8
oxygen therapy		
Unsatisfactory	5	7.7
Satisfactory	60	92.3
parents' health education		
Unsatisfactory	35	53.8

Nurses' performance	No. (n=65)	Percent
Satisfactory	30	46.2

Table (3): Observed that the majority of studied nurses (95.4%) had unsatisfactory performance in the assessment of admission, it was observed that the great majority of nurses (96.9%, 93.8%, 92.3%) had unsatisfactory performance regarding drawing blood sample, blood transfusion, and oxygen therapy, while more than half of them (53.8%) had unsatisfactory performance about parents' health education

Table (4): Percentage of the total score of nurses' performance related to care of children with G6PD deficiency

Level of performance	No.	Percent
Unsatisfactory	39	60.0
Satisfactory	26	40.0

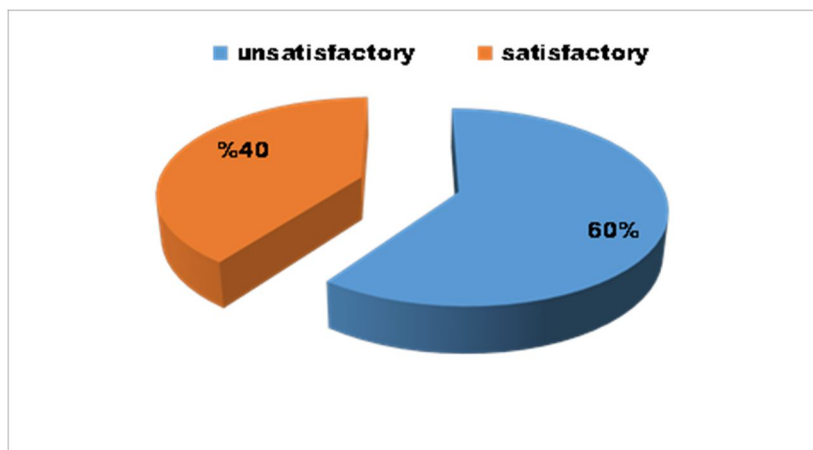


Figure (2): Percentage of total score of nurses' practice about G6PD deficiency (n=65).

Table (5), Figure (2): observed that more than half of nurses (60.0%) had satisfactory practice, while 40.0% of them had unsatisfactory practice related to the care of children with G6PD deficiency

Table (5): Relation between nurses' demographic characteristics and their total knowledge score about G6PD deficiency (n=65).

Demographic characteristics	Total score of knowledge						X ²	P-value
	Poor level (n=17)		Fair level (n=24)		Good level (n=24)			
	No.	%	No.	%	No.	%		
Age								
< 30 years	11	22.5	15	30.6	23	46.9	9.861	0.131
30<40	5	38.4	7	53.9	1	7.7		
40<50	1	50	1	50	0	0		
≥50 and more	0	0	1	100	0	0		
Residence								
Urban	11	31.4	13	37.2	11	31.4	1.428	0.490
Rural	6	20	11	36.7	13	43.3		
Level of education								
Nursing diploma	6	20	9	30	15	50	6.254	0.181
Bachelor of Nursing	10	32.3	12	38.7	9	29		
Master & PHD	1	25	3	75	0	0		
Years of experience								
< 5 years	13	28.9	11	24.4	21	46.7	10.396	0.034*
5 – 10 years	3	21.4	9	64.3	2	14.3		
>10 years	1	16.7	4	66.6	1	16.7		
years of work experience in the current area								
< 5 years	15	28.4	16	30.1	22	41.5	7.017	.135
5 – 10 years	2	28.6	4	57.1	1	14.3		
>10 years	0		4	80	1	20		
training courses								
NO	13	28.3	17	36.9	16	34.8	1.031	.597
YES	3	16.7	7	38.9	8	44.4		
Place of work								
PICU	1	7.1	6	42.9	7	50	11.186	0.025*
the therapeutic unit	10	25.6	12	30.8	17	43.6		
pediatric hematology and oncology unit	6	50	6	50	0			
Gender								
Male	4	17.4	9	39.1	10	43.5	1.506	0.471
Female	13	30.9	15	35.7	14	33.4		

*Statistically significant differences P < 0.05

Table (5) shows that 46.7% of nurses who had years of experience less than five years had a good level of knowledge as well as it was observed that half of the nurses who worked in PICU (50%) had a good level of knowledge compared to nurses who work in the therapeutic unit (43.6%) with Statistically significant difference (X² = 10.396 & P – value = 0.034; X² = 11.186 & P –

value = 0.025 respectively). No statistically significant difference were found between the age, residence, level of education, training course attendance, nurses' gender, and their total knowledge score of G6PD deficiency.

Table (6): Relation between nurses' demographic characteristics and their total score of practice about G6PD deficiency (n=65)

Demographic characteristics	Total score of practice				X ²	P-value
	Unsatisfactory (n=39)		Satisfactory (n=26)			
	No.	%	No.	%		
Age						
< 30 years	25	51	24	49	6.928	0.074
30<40	11	84.6	2	15.4		
40<50	2	100	0	0		
≥50 and more	1	100	0	0		
Residence						
Urban	22	62.9	13	37.1	.258	0.612
Rural	17	56.7	13	43.3		
Level of education						
Nursing diploma	14	46.7	16	53.3	4.151	0.125
Bachelor of Nursing	22	70.9	9	29.1		
Master & PHD	3	75	1	25		
Years of experience						
< 5 years	26	57.8	19	42.2	8.432	0.015*
5 – 10 years	4	28.6	10	71.4		
>10 years	3	50	3	50		
Years of work experience in the current area						
< 5 years	32	60.4	21	39.6	.027	0.987
5 – 10 years	4	57.1	3	42.9		
>10 years	3	60	2	40		
Training courses						
NO	29	63	17	37	.913	0.339
YES	9	50	9	50		
Place of work						
PICU	0	0	14	100	27.393	0.0001*
the therapeutic unit	31	79.5	8	20.5		
pediatric hematology and oncology unit	8	66.7	4	33.3		
Gender						
Male	12	52.2	11	47.8	.908	0.341
Female	27	50.9	26	49.1		

***Statistically significant differences P < 0.05**

Table (6) shows that 71.4% of nurses with 5-10 years of experience had satisfactory practice with statistically significant differences ($X^2 = 8.432$ & P - value = 0.015). The statistically significant difference was illustrated between nurses' workplace and their total practice score ($X^2 = 27.393$ & P - value = 0.0001). It was observed that the great majority (100%) of nurses who work in PICU had satisfactory practice. No statistically significant difference were found between the age, residence, level of education, attendance of training course, and nurses' gender and their total score of practice related to care of children with G6PD deficiency.

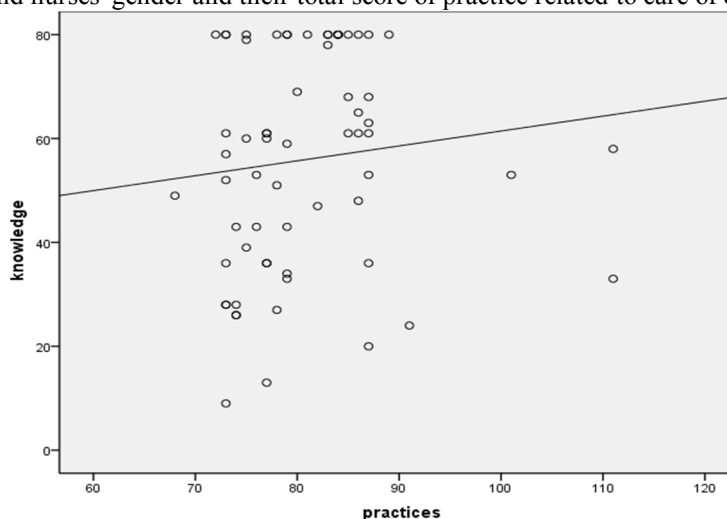


Figure (3): Correlation between total score of studied nurses' knowledge and practice (n=65).

Figure (3) showed no correlation between the total score of studied nurses' knowledge and practice.

Discussion

The current study demonstrated that two third of the participants were under 30, whereas over half of them resided in urban regions. Regarding education, approximately half of them hold a bachelor's degree. Additionally, over more than

half of them had less than five years of experience, with the majority of their experience being in the current field for less than five years. Furthermore, over two-thirds of them had not completed any previous training courses. Lastly, more than half of them were employed in the therapeutic unit of the

Minia Regional Blood Transfusion Center in Minia City.

These findings were in line with **Mosa (2022)**, who studied "Assessment of nurses' knowledge about the care of children with Glucose-6-Phosphate Dehydrogenase Deficiency" and reported that most of the participants were female, half of them had a diploma in nursing in addition, years of experience more than three-quarters of nurses 25 had (1-5 years) in the service. However, the current study is inconsistent with the same author, reporting that more than half of them have diplomas in nursing, most of them had training courses, and most were the number of training courses (1-5 sessions).

These findings were congruent with **Abass et al. (2015)**, who studied "nurses' knowledge and performance related to the care of children with glucose-6-phosphate dehydrogenase deficiency at Assiut University Children's Hospital" and reported that most of the studied nurses didn't attend any previous training courses related to G6PD deficiency. The same author disagrees with the current study, reporting that most of the studied nurses had more than ten years of experience, and most had diploma degrees.

Concerning the total score of nurses' knowledge related to caring for children with G6PD deficiency, the present study showed that more than one-quarter had poor knowledge. In contrast, over one-third had a fair and good knowledge of G6PD deficiency. From the researcher's point of view, this result may be related to a lack of updated knowledge, availability of suitable educational materials, and refreshing courses. They did not participate in any educational programs offered by organizations to enhance their understanding of G6PD deficiency, and the majority of them lacked sufficient educational preparation.

This finding was agreed with **Elgammal et al. (2020)**, who studied "Effect of Nursing Intervention program about Care Provided for Children Suffering from Favism on Nurses' Performance" and reported that the majority of the studied nurses showed poor knowledge. Also, this result was confirmed by **Eid et al. (2019)** who studied "Develop guidelines instructions for nurses regarding caring of children suffering from Favism" and reported that more than half of the studied nurses had unsatisfactory knowledge.

Contrary to the findings of **Wojnarski et al. (2020)**, who examined the "Evaluation of the Care Start glucose-6-phosphate dehydrogenase (G6PD) rapid diagnostic test in field settings and assessed the perceived risk of primaquine at the community level in Cambodia," this study reveals that the majority of nurses did not have satisfactory knowledge scores.

Concerning nurses' practices related to admission assessment, the present study showed that the majority of them don't practice physical assessment related to general, head, eyes, ears, nose, mouth, neck, and neurologic.

This result agrees with **El-Shanshory & Farag (2020)**, who studied the "Effect of Nursing Intervention program about Care Provided for Children Suffering from Favism on Nurses' Performance" and reported that most studied nurses didn't physically assess children. Also, this result aligns with **Eid et al. (2019)**, who stated that most of the studied nurses had a low level of practice regarding child physical assessment.

This result disagrees with **Kool et al. (2015)**, who studied "Reliability of parent-reported alarming symptoms in febrile children in general practice" and reported that nurses

must examine the children physically and note symptoms and findings. Also, **Lilley et al. (2022)** studied "Pharmacology and the nursing process" and reported that the nurse should perform the complete assessment for children with G6PD deficiency on admission.

Regarding nurses' practice regarding parents' health education, the present study illustrated that more than half didn't provide health education regarding triggers, avoided medications, diagnosis, complications, and treatment. *From the researcher's point of view*, this result may be related to the fact that the nurses were unaware of how they perceived and use Learning Principles and the parent education skills they have gained through years of experience.

This result aligns with another study conducted by **Thompson et al. (2020)**, who studied "How nurses and other health professionals use learning principles in parent education practice" and reported that nearly two-thirds of nurses didn't perform health education for the parents. This result is contraindicated by **Gad El-Bastwese et al. (2020)**, who studied "Health Education Program for Mothers who, their Children Diagnosed with Favism" and reported that nurses play an important role in the community by providing health education program for mothers regarding favism and guide them about how to deal.

In addition, this result differs from **Gad et al. (2021)**, who studied the "Effect of Family-centered Empowerment Model on Knowledge and Stress Level among Mothers of Children with Glucose-6-Phosphate Dehydrogenase Enzyme Deficiency" and reported that nurses are responsible for empowering the children and their family caregivers to be able to care for themselves as much as possible.

Regarding total nurses' practice related to the care of children with G6PD deficiency, the current study presented that more than half of nurses had unsatisfactory practice, while two-fifths had satisfactory practice related to the care of children with G6PD deficiency. *From the researcher's perspective*, this outcome could be attributed to a deficiency in training programs focused on caring for children with G6PD deficiency.

This result comes in accordance with **Elnagar et al. (2020)**, who studied the "Effect of coaching technique on nurses performance in the care of children suffering from thalassemia major" and reported that the majority of the studied sample had unsatisfactory practices. In addition, this result comes in accordance with **Chouhan et al. (2021)**, who studied "Nurses' Knowledge and Role on Care of Children with Thalassemia" and reported that the majority of the studied nurses had incompetent knowledge regarding the care of the children.

Concerning the relation between nurses' demographic characteristics and their total knowledge score about G6PD deficiency, the present study illustrated a statistically significant difference between nurses' years of experience in the workplace and their total knowledge score. From the researcher's point of view, this may be explained as nurses with more experience might have better opportunities to access up-to-date information about the care of children with G6PD deficiency gradually from their daily observation practices.

This result aligns with **Mosa (2022)**, who reported no statistically significant differences between the studied sample demographic characteristics and their total knowledge regarding G6PD deficiency. Also, this result was confirmed

by Chouhan et al. (2021), who reported no statistically significant differences between the studied sample knowledge and the studied nurses' personal characteristics.

In addition, finding of the present study was supported by Abass et al. (2015), who studied "Nurses' Knowledge and Performance Related to Care of Children with Glucose-6- Phosphate Dehydrogenase Deficiency at Assiut University Children's Hospital" and p that statistically significant differences between the studied nurses' years of experience and workplace and their knowledge.

While this result come inconsistent with Shokr et al. (2022), who reported that there were highly statistical significance differences between the studied sample knowledge level and the studied nurses' personal characteristics

Regarding the relation between nurses' demographic characteristics and their total score of practice in caring for a child with G6PD deficiency, the current study showed statistically significant differences between nurses' years of experience and their total score of practice. There was a statistically significant difference between nurses' workplace and their total practice score ($X^2= 27.393$ & P - value= 0.0001).

This result aligns with Shokr et al., (2022), who reported no statistical significance differences between the studied sample practice level and the studied nurses' personal characteristics. In addition, this result agrees with Abolwafa et al. (2019), who studied "Quality of nursing care among school-age children with thalassemia as regards blood transfusion and self-concept" and mentioned that there was no significant relationship between nurses' practices regarding nursing care for children and their personal characteristics

Regarding the correlation between the total score of staff nurses' knowledge and practice, the current study showed no correlation between the total score of staff nurses' knowledge and practice. This result aligns with **Mohammed (2018)**, who studied "Nurses' knowledge about nursing care of leukemia children at Zagazig University Hospital" and reported a negative correlation between the total score of staff nurses' knowledge and practice. At the same time, this result is contraindicated with **Elgammal et al. (2020)**, who reported a positive correlation between the total knowledge scores of the studied nurses.

CONCLUSION

According to the results of the current study, it was concluded that over 25% of the participants had a low level of knowledge. In contrast, more than 33% had a high level of knowledge regarding G6PD deficiency. Furthermore, a majority of the nurses demonstrated satisfactory practice, while a majority exhibited unsatisfactory practice in health education. Additionally, the majority of nurses displayed unsatisfactory practice when it came to conducting physical assessments upon admission. Furthermore, there was no discernible correlation between the overall score of the nurses' knowledge and their practical application. Furthermore, statistically significant disparities were observed in the knowledge, years of experience, workplace, and caregiving practices of the studied sample concerning the care of children with G6PD deficiency

Recommendations

Based on the results of the present study, he

following recommendations are proposed:

For nurses:

- Provide nursing education and in-service training programs that focus on G6PD in children. These programs should be well-equipped with educational facilities and materials to enhance the nurse's knowledge and skills in caring for children with G6PD deficiency.
- It is essential to motivate nurses to participate in scientific training and conferences to stay up to date with the ever-expanding body of knowledge and skills required for effective nursing care.
- An exclusive orientation program should be formulated for recently recruited nurses to equip them for their roles in pediatric units adequately.
- Provision of procedural guidelines for nurses to be informed about in order to address any potential issues that may occur

For further researches

- Replication of this study on a larger probability sample acquired from different geographical areas in Egypt to assess the nurses' knowledge and practices regarding children with G6PD.
- More research should be conducted to enhance nurses' understanding and procedures regarding blood transfusion and care for children with G6PD

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