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Community pharmacists' knowledge about medication use in glucose-6-phosphate-dehydrogenase G6PD deficiency in Khartoum, Sudan: A descriptive study

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Abstract

Glucose-6-phosphate dehydrogenase G6PD is a cytoplasmic enzymes that are found in all cells of the human body, it plays an essential and vital role in preventing cellular damage from reactive oxygen radicles ROS. Pharmacist can play a major role in providing G6PD deficient patients with the useful information about medications that needs to be avoided in such conditions. Therefore, this study was conducted to assess the pharmacist knowledge about medications use in G6PD deficient patients. Study's results showed that most of the pharmacists were able to define G6PD deficiency correctly. However, majority were not able to identify risk factors for hemolysis correctly. With regards to the pharmacists' knowledge about drug usage pattern in G6PD deficient patients, they showed an overall good knowledge as they were able to correctly identify the contraindicated and used with caution medications. Pharmacists should use continuous pharmaceutical education to keep up with updated evidence based information regarding medication use in specific population such as G6PD deficient individuals especially in G6PD prevalent regions.

Keywords: Pharmacist, knowledge, G6PD, contraindicated, used with caution, hemolysis

Introduction

Glucose-6-phosphate dehydrogenase G6PD is a cytoplasmic enzymes that are found in all cells of the human body (Cappellini and Fiorelli, 2008) [8]. NADPH is essential to produce reduced glutathione which is a critical step in protecting the cells from oxidative damage (Figure 1) (Efferth *et al.*, 2006, Cunningham *et al.*, 2016) [12, 11]. It plays an essential and vital role in preventing the cellular damage as it catalyzes the rate-limiting reaction and the first step of the pentose phosphate pathway PPP in which NADPH is produced as a result of oxidation of glucose-6-phosphate into 6-phosphogluconolactone i.e. preventing cellular damage from reactive oxygen radicles ROS (Antwi-Baffour *et al.*, 2019, Richardson and O'Malley, 2017, Arese *et al.*, 2012, Al-Ani *et al.*, 2020) [6, 19, 7, 3]. The red blood cells (RBCs) are vulnerable to the formation of reactive oxygen species which is also known as free radicle (Antwi-Baffour *et al.*, 2019, Richardson and O'Malley, 2017) [6, 19].

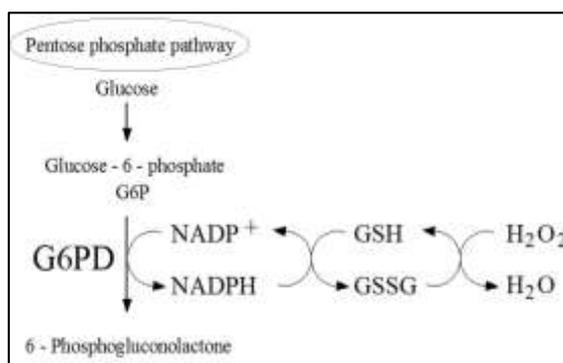


Fig 1: Role of Glucose-6-phosphate dehydrogenase G6PD in the pentose phosphate pathway PPP (Al-Ani *et al.*, 2020) [3]

Pharmacists are one of the consistently reported source of medication related information in many population (Alani *et al.*, 2020, Hassali *et al.*, 2011) [3, 17]. Besides, pharmacists can play an essential role in providing G6PD deficient patients with the useful information about medications that needs to be avoided in such conditions i.e. G6PD (Thompson, 2020) [20]. Pharmacist should be able to identify drugs with definite risk of hemolysis i.e. contraindicated, and drugs with possible risk of hemolysis i.e. used with caution (Table 1). Therefore, we conducted this study to assess the pharmacist knowledge about medications use in G6PD deficient patients.

Table 1: Drug usage pattern in G6PD deficient patients, adapted from British national formulary BNF (Committee, 2019).

Drug	Definite Risk (Contraindicated)	Possible Risk (Used with caution)
Co-trimoxazole	√	
Ascorbic acid		√
Aspirin		√
Chloroquine		√
Ciprofloxacin	√	
Nitrofurantoin	√	
Dapsone	√	
Probenecid		√

Ethical consideration

This study was approved from the research committee at The National University. Also, verbal consent were taken from participants prior to the enrollment in the study.

Methodology

Study Design and Population

This was a cross-sectional descriptive study which was carried out in 2016 in Khartoum, Sudan. A self-administered questionnaire was distributed to 50 community pharmacists in Khartoum, Sudan. Only pharmacist were included in this study. Pharmacist assistants and trainee were excluded from the study. The outcomes of this study were to evaluate the knowledge of community pharmacists about G6PD deficiency and the drugs usage pattern in glucose-6-phosphate-dehydrogenase deficient patients. Convenience sampling method which is defined as following: the researcher have recruited any participants that are easy to get and only participants who are available and have given consent have been recruited as a respondent. Participants have fulfilled the inclusion criteria before being engaged in the study (Gravetter and Forzano, 2018) [15].

Data collection tool

Data were collected using a validated semi-structured questionnaire. The questionnaire consisted of 3 main sections: section A concerned with demographic data of participants, section B concerned with knowledge about G6PD and its risk factors. Section C involved questions to assess pharmacist's knowledge about drug usage pattern in G6PD deficient patients.

Statistical analysis

Data were analyzed via the Statistical Package for Social

Sciences SPSS, version 23 (Corp, 2016) [10]. Descriptive statistics were used to describe the data; were applicable, continuous data presented as mean \pm standard deviation (SD), and categorical data expressed as numbers with percentages.

Results

Participants' demographic data

Almost half of the participants 48% aged 25-34 years old at the time of data collection. Majority were females 74%. Out of the 50 respondent, forty-four percent of them were senior pharmacists while the rest of them were pharmacists and beginner pharmacists 32%, and 24% respectively (Table 2).

Table 2: Participants' demographic characteristics

Variables	Number of respondents, (n)	Percentage of respondents (%)
Age Range (years old)		
Less than 24	20	40
25-34	24	48
35-44	3	6
45-54	3	6
Gender		
Male	13	26
Female	37	74
Ministry of health title		
Beginner pharmacist	12	24
Pharmacist	16	32
Senior pharmacist	22	44

Pharmacist's knowledge about G6PD deficiency as a disease

When the participants asked about the definition of glucose-6-phosphate-dehydrogenase deficiency, most of them 82% were able to answer it correctly. However, when it comes to the risk factors associated with hemolysis in G6PD deficient patients, less than half 48% were able to correctly identify risk factors (Table 3).

Table 3: Pharmacists' knowledge about G6PD deficiency

Variables	Number of respondents, (n)	Percentage of respondents (%)
G6PD deficiency		
True	41	82
False	9	18
Risk factors for hemolysis		
True	24	48
False	26	52

Pharmacists' knowledge about medication usage pattern in G6PD deficient patients

Table 4 shows that the majority of current study participants identified that the use of co-trimoxazole, chloroquine, ciprofloxacin, nitrofurantoin, and dapsone 70%, 66%, 68%, 56%, and 78% respectively are contraindicated in glucose-6-phosphate-dehydrogenase deficient patients. On the other hand, most of them stated that ascorbic acid, aspirin, and probenecid 80%, 66%, and 74% respectively as medications that can be used with caution in G6PD deficient patients.

Table 4: Pharmacists' response about medication usage pattern in G6PD deficient patients

Variables	Number of respondents, (n)	Percentage of respondents (%)
Co-trimoxazole		
Contraindicated	35	70
Used with caution	15	30
Ascorbic acid		
Contraindicated	10	20
Used with caution	40	80
Aspirin		
Contraindicated	17	34
Used with caution	33	66
Chloroquine		
Contraindicated	33	66
Used with caution	17	34
Ciprofloxacin		
Contraindicated	34	68
Used with caution	16	32
Nitrofurantoin		
Contraindicated	28	56
Used with caution	22	44
Dapsone		
Contraindicated	39	78
Used with caution	11	22
Probenecid		
Contraindicated	13	26
Used with caution	37	74

Discussion

There are few studies that assessed the pharmacists' knowledge about G6PD deficiency. Most of the studies were conducted to evaluate the prevalence, public awareness, and awareness of pregnant women about G6PD deficiency (Al Arrayed and Al Hajeri, 2011, Almuhaini *et al.*, 2018, Almuhaini *et al.*, 2017, Hasan, 2018, Kasemy *et al.*, 2020) [2, 4, 5, 16, 18].

Most of the current study participants aged 25-34 years, this explains why 44% were senior pharmacist i.e. had 5 or more years of practical experience as a pharmacists. Moreover most of the respondents were females 77% this is in accordance with a study conducted by Elhag and colleagues among community pharmacists in Khartoum which also showed that the majority of community pharmacist in Khartoum were females (Elhag and Sulaiman, 2020) [14].

When it comes to the pharmacists' knowledge about G6PD deficiency as a disease, Most of the pharmacists were able to define G6PD deficiency correctly. However, majority were not able to identify risk factors for hemolysis correctly. With regards to the pharmacists' knowledge about drug usage pattern in G6PD deficient patients, they showed an overall good knowledge as they were able to correctly identify the contraindicated and used with caution medication. This counteract with a study done by Ahmed Elgamel and colleagues in Khartoum (2013) [13] that was conducted through a prescription containing (Cotrimoxazole) that was given to 70 pharmacist, only 7 pharmacist was able to identify the drug as contraindicated, this shows that pharmacists awareness in Khartoum has been improved since 2013 (Elgamel *et al.*, 2013) [13].

It is worth mentioning that that there are lack of concerted evidence that supports the association with drug-induced hemolysis for many medications and lots of medications that have been prohibited maybe safe to be administered in therapeutic dosages G6PD deficient population. This shows the need for an evidence-based international consensus guideline regarding medication use in G6PD-deficient

patients (Youngster *et al.*, 2010) [21].

The current study has provided an insight about the knowledge of community pharmacist in Khartoum, Sudan about medication usage pattern in G6PD deficient patients. However, there are several limitations several limitations including the relatively small sample size, the close-ended questions in the questionnaire which may have restricted the participants' capacity to explain the underlying reason for a certain outcome and the capacity of the study's finding to be generalized to other geographical areas. Therefore, it is recommended that future studies should include a larger sample size, and to be conducted in various geographical regions.

Conclusion

The current study has provided an insight about the knowledge of community pharmacist. Overall, pharmacists expressed a good knowledge regarding the medication usage pattern in glucose-6-phosphate dehydrogenase G6PD deficient patients. Pharmacists should use continuous pharmaceutical education to keep up with updated evidence-based information regarding medication use in specific population such as G6PD deficient individuals especially in G6PD prevalent regions.

Conflict of interests

The authors have no conflicts of interest to declare

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