Original Article

# Prevalence of Glucose-6-phosphate Dehydrogenase Deficiency in People Visiting Health Care Center, KFU, Al-Hasa

Glucose-6-phosphate Dehydrogenase Deficiency

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## ABSTRACT

**Objective:** To determine the prevalence of G6PD deficiency in people visiting Health Care Center of King Faisal University (KFU), Al-Hasa.

**Study Design:** Observational / Descriptive study.

**Place and Duration of Study:** This study was conducted at the Health Care Center, KFU, Al-Hasa, from August 2014 to April 2015.

**Materials and Methods:** Patients presenting with weakness and anemia were included in the study. Total 214 patients, consisting of 116 children (age 3 to14 years) and 98 adults (age 15 to 50 years), were screened. The blood samples were analyzed by using "G6P-DH Fluorescence Screening Test". This kit detects fluorescence under U/V lamp if the sample has G6PD activity.

**Results:** Total 36 (16.8%) of the 214 patients, tested, were deficient for G6PD. Among those deficient patients, 15 (7%) were children (11 males and 4 females), and 21 (9.8%) were adults (13 males and 8 females). The highest prevalence of G6PD-deficiency occurred among adults, particularly males.

**Key Words:** G6PD deficiency, Red blood cells, Enzymopathy, Anemia.

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## INTRODUCTION

Glucose-6-phosphate dehydrogenase (G6PD) is the major enzyme for red blood cells (RBCs) to get the energy from glucose[1]. It produces reduced nicotinamide adenine dinucleotide phosphate and reduced glutathione phosphate that play an important role in protecting cells from oxidative damage. Deficiency of G6PD is an enzymopathological disorder of RBCs in humans which is caused due to mutations in G6PD gene, located on X-chromosome[2]. Therefore, this deficiency is most common among males[3]. G6PD deficiency is one of the most common enzyme disorders, affecting more than 4 million people worldwide[4]. It has high prevalence in Mediterranean, Asian, and African people[5]. In the Middle East it has high range that varies from 3% to 29% [6,7]. In Asia, the prevalence ranges from 6.0% to 15.8%,[8,9] and in Africa, from 3.6% to 28%[9,10].

Lots of individuals with G6PD-deficiency usually do not experience any signs or symptoms, only some individuals present with hemolytic anemia. A wide range of hemolytic syndromes is included in the clinical manifestations of G6PD deficiency. G6PD deficiency is usually associated with acute hemolytic anemia and neonatal jaundice, which is usually a result of external oxidant agents[11]. Some oxidant agents such as fava beans[12-14], topical application of henna[15,16] and infections[17-19] have been reported to trigger hemolytic anemia in G6PD-deficient individuals. This disorder had been also shown to be common in our region Al-Hasa several years ago (in 1998)[20]. However, there is a paucity of current prevalence and awareness of G6PD deficiency among people visiting Health Care Center of KFU. Therefore, this study was specifically aimed to determine the prevalence of G6PD deficiency among people visiting the Health Care Center of KFU.

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## MATERIALS AND METHODS

**Subjects and samples:** The patients presenting with weakness and anemia were screened for G6PD. The study contained 214 patients, consisting of 116 children (age 2 to 14 years), including males 49 (42.2%) and females 67 (57.8%), and 98 adults (age 15 to 50 years old), including males 25 (25.5%) and females 73 (74.5%). The peripheral blood sample (2-3ml) was collected and analyzed for G6PD screening.

**Material and Procedure:** For screening of G6PD, the kit "G6P-DH Fluorescence Screening Test" (supplied by UDi Dammam company) was used. 5 micro liters of whole blood were collected in a suitable anticoagulant and added into a test tube with 100 micro liters of working reagent, provided in the kit. This mixed tube

was put on Filter Paper and allowed to air-dry for 30 min. After the Filter Paper was completely dry, it was observed under a long wave UV-lamp in a darkened room. The positive and negative controls, provided in the kit, were run in parallel. The samples which did not fluoresce were labelled as deficient for G6PD.

## RESULTS

Out of 214 patients, 36 (16.8%) were deficient for G6PD. Amongst those G6PD deficient patients, 15 (7%) were children, including 11 (73.3%) males and 4 (26.7%) females, and 21 (9.8%) were adults, including 13 (61.9%) males and 8 (38.1%) females. Figure 1 describes the number of patients, deficient for G6PD-deficiency in individual group. Figure 2 shows the percentage of the patients, deficient for G6PD in individual group. On the basis of individual groups of the subjects, we had 4 groups, i.e., female children, female adults, male children and male adults. The highest prevalence of G6PD-deficiency was found among male adults which was 13 of 25 (52%). The second most common group was male children, which was 11 of 49 (22.4%). The third common group was female adults, which was 8 of 73 (10.9%), and the fourth group was female children which was 4 of 67 (5.9%).

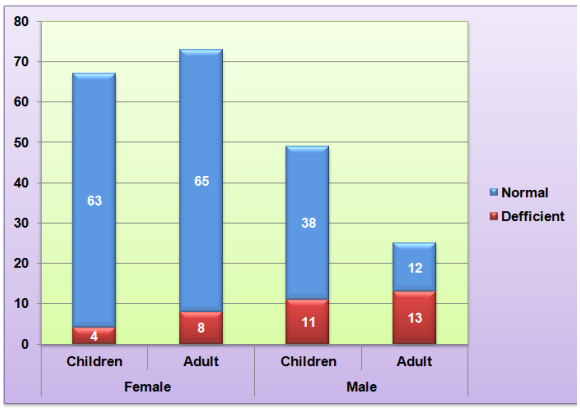


**Figure No.1. Number of patients with G6PD deficiency (red box) among individual group.**

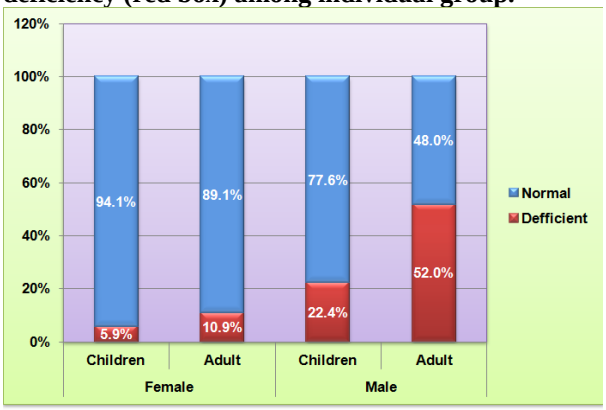


**Figure No.2. Percentage of patients with G6PD deficiency (red box) among individual group.**

## DISCUSSION

G6PD deficiency has high prevalence in Mediterranean, Asian and African people[5].The prevalence of G6PD deficiency in all over the Middle East was reported to have high range variation from 3% to 29%[6,7]. In Asia, the prevalence ranges from 6.0% to 15.8%[8,9] and in Africa between 3.6% to 28.0%[9]. Saudi Arabia, which is in the Middle East, is a large country with around 30 million people living in an area of 2,149,690 km2, and the research has reported variable incidence of G6PD deficiency among Saudi populations in its various regions[21]. In our current study, we investigated the prevalence of G6PD deficiency in people who visited Health Care Center of KFU Al-Hasa with the clinical presentation of weakness and anemia. We investigated a significant prevalence of this disorder, which was 16.8%. In comparison to the other studies, we have unique findings as we investigated the patients who were or belonged to the literate members of King Faisal University AL-Hasa. The highest prevalence of G6PD deficiency was found among adult males. The second most common group was male children. Our findings justify the prevalence of G6PD deficiency among males as it is an X-linked disease which most commonly affects this group[2,3]. Other groups in KSA have investigated the prevalence of this disease in general population which include both literate and illiterate people. For example, previous reports on G6PD deficiency showed the prevalence of 45.9% in Al-Qatif and 36.5% in Al-Hasa Saudi Arabia[22]. Alabdulaali et al. reported an incidence of G6PD deficiency of 1.13% in blood donors in the capital city Riyadh[23], while in the rural city of Al-Kharj it was found to be 1.91%[24]. Other studies in the big cities, such as, Najran, Riyadh, Bisha, Al-Ula and Makkah[25-27] showed the range from 3.5 to 6.7%. The frequencies in Al Hofuf, Khubar and Jazan[25], and Al-Baha[28], and Al Qunfudhah[29] have been reported to be between 11.6 and 18%. Alharbi and Khan showed the prevalence of 4.75 in Taif city[30]. These results variate from region to region, being common in certain regions and less common in other regions of KSA.

Though our results are consistent with the previous studies to have the prevalence of around 17% of this disease, our findings differ from other groups as we chose a restricted group of patients, belonging to literate people of KFU, who visited the health care center of KFU with the clinical presentation of weakness and anemia. Therefore, in our study the patients who were not deficient for G6PD, might be suffering from other hematological disorders. This is an alarming sign that there is a lack of awareness of G6PD deficiency disorder among even the KFU people. Furthermore screening and genetic counciling programs for not only G6PD deficiency but also for other genetically transmitted hematological disorders need to be conducted throughout Al-Hasa region on big

platform including educational institutes and public places.

Therefore, there is a need to arrange the awareness programs on G6PD deficiency and its screening and genetic counciling throughout Al-Hasa province.

# CONCLUSION

This study has shown a significant prevalence of G6PD deficiency among KFU population and their families. Further health programs on G6PD deficiency need to be launched throughout Al-Hasa region in order to avoid the factors which cause hemolysis in these patients and to prevent the transmission of this disease to the next generations through genetic counseling.

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**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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