KHARTOUM
MEDICAL JOURNAL
The Official Journal of the Faculty of Medicine, University of Khartoum
Published every four months

Address
P.O. Box 102, Khartoum, 11111 Sudan
E-mail:khartoummedicalj@gmail.com
E-mail:kmj@meduofk.net
Tel.: +249155171858
ISSN 1858-5345

Ethical policies and procedures
- Any material submitted for publication in KMJ must conform to the ethical norms as defined by the Faculty of Medicine, University of Khartoum, Research and Ethical Committees.
- Research papers must be the result of original work and should not be submitted for publication elsewhere.
- Any related previously published work must be referred to by the author(s).
- Authors and co-authors are equally and completely responsible for their manuscripts and should all be aware of contents and have substantial contribution to the work done.
- Authors should accept full legal, moral, scientific and professional responsibility for their articles.
- Authors should include an acknowledgement of data, material or assistance they obtained and used that may otherwise lead to conflicts with other papers.
- Reviewers and readers are expected to report any duplication or fraud they recognize in a manuscript to the Editor-in-Chief. The Editorial Board will investigate the matter and take the appropriate action.
- KMJ reserves the right to accept or reject any article submitted for publication.

Khartoum Medical Journal Objectives
1. Provide a forum for scientific and clinical medicine publications.
2. Serve the medical community in Sudan and the region in the field of continuing medical education.
3. Offer opportunities for the publication of service-oriented research and disseminate information aimed at the promotion of health services.
4. Encourage the development of medical and allied sciences research.
5. Provide opportunities for development of expertise in medical and allied sciences education.
6. Act as a platform for the expression of professional and scientific opinion and exchange of information.
7. Provide a forum for the exchange of ideas and experiences in the field of education and training in the medical and health professions.

Contents

Original Articles

Health Education

Original Article

Prevalence of asymptomatic bacteriuria in school children in Khartoum State, Sudan

Nahid M A Abdalrahman[1], *Eltigani M A Ali[2] , Taj Assir A Abdalla[3]

[1]*Postgraduate Student*[1]

[2]*Department of Paediatrics & Child Health, Soba University Hospital, Faculty of Medicine, University of Khartoum, Sudan*[2]

[3]*Department of Paediatrics,International African University, Sudan*[3]

Abstract

Background: prevalence of asymptomatic bacteriuria (ABU) in school children is variable worldwide and treatment and screening are controversial. Our aim was to determine the prevalence of ABU in school children in Khartoum State.

Materials & Methods: this was a cluster randomized survey among school children aged 5-16 years from randomly selected basic schools in Arkaweet Area in Khartoum State. Midstream urine samples in sterile containers were sent to the laboratory within ½-1 hour where they were tested by nitrites (N) and leukocyte esterase (LE) dipsticks and cultured on Cystine Lactose Electrolyte Deficient (CLED) agar. Antibiotic sensitivity discs were then added. After evaluating colony count, organisms were identified by biochemical tests.

Results: Three handred fourty five school children: girls 58% and boys 42%, were enrolled in the study. The overall prevalence of ABU was 2.6%. The prevalence was 3.5% for girls and 1.6% for boys. Isolated organisms were *Cedecea davisae* (33.3%), *Staphylococcus aureus* (22.2%), *Escherichia coli (E. coli)*, *Citrobacter, Proteus mirabilis*, *Providencia rettgeri* (11.1%) each. Sensitivity of LE and N dipsticks was 22.2% & 11.1% respectively, whereas specificity was 98.8% & 99.9% respectively. The positive predictive value (PPV) for LE and N tests was 33.3% & 25% respectively ,whereas the negative PV(NPV) was 97.9% & 97.7% respectively. When using both LE and N, the positive PV was 50% whereas the specificity and the negative PV was 99.9% and 99.7% respectively. ABU was not significantly associated with any of the potential risk factor (P>00.5 for all).

Conclusion: the prevalence of ABU in school children in Khartoum State is low, but higher than in other countries. Urine dipsticks can rule out urinary tract infection (UTI) if both N and LE tests are negative. However, urine culture is mandatory to confirm diagnosis in positive dipsticks samples.

***Corresponding Author:** Department of Pediatrics & Child Health, Soba University Teaching Hospital, Khartoum, Sudan E-mail: eltigani_ali@yahoo.com*

Introduction

ABU is defined as the presence of significant bacteria in the urine (usually 10^5 organism /ml) without symptoms(1). Studies on screening for ABU were done on assumption that early detection and treatment of infection may prevent kidney damage. However, much controversy still exists on how frequently and seriously ABU affect the kidney and whether adequate treatment might prevent its damage. Urine culture is the most specific and reliable method test to confirm urine infection, but

it is costly and it is not a rapid test for screening large number of children. Such task will be difficult unless the test used is: simple, cheap, rapid, accurate, acceptable to children, parents, school health authorities and bacteriologists, is used[2,3]. Urine dipstick tests (leukocyte esterase [LE] and nitrite [N]) have been used to diagnose UTI and to screening for ABU in primary care settings[4]. Variable prevalence rates of ABU in school children (1%-11%3) have been reported with females predominating over males[1, 5-8]. In most of the studies, the commonest culture isolate was E. coli [7, 8] ,but in some non-E. coli pathogens were found to be more common[6]. We conducted this study to determine the prevalence of ABU in a population of school children in Khartoum State -Sudan, to identify the causative organisms, and to test the accuracy of urine dipsticks in screening for bacteriuria.

Materials and methods

The study was a cluster randomized survey among school children aged 5-16 years from randomly selected public schools in Arkaweet Area in Khartoum State. This area has 13 basic schools with a total number of 4, 838 children (2868 females, 1970 males). The study was conducted in the period between June 2011 and March 2012. Children who received recent antibiotic therapy were excluded. A sterile wide mouth container was given to each child to obtain a mid-stream sample. Within half –to- one hour all urine samples were transported to the microbiology laboratory where they were processed and tested for presence of nitrites (N) and leukocyte esterase (LE) by dipsticks. Samples were then cultured using standard loop technique [9] by using 0.001 ml calibrated wire to inoculate Cystine Lactose Electrolyte Deficient (CLED) agar plates [10] and incubated at 37°C for 24 hours. Pathogens were identified and colony counts were determined using standard microbiological techniques (gram stains, microscopy, motility and biochemical tests (Citrate, Indole, Lipase, Lysine, Tri Sugar Iron Agar [TSI], Urease, and Voges-Proskauertests). Colony count of $>10^5$/ml of CFU were read as significant growth. Antimicrobial testing was done according to Kirby–Bauer method for significant pathogens[9]. The antibiotic discs used were Ceftriaxone, Cefixime, Gentamycin, Cephelexin, Trimethoprim/ Sulphamethaxazole, and Nalidixic acid. The sensitivity, specificity, positive and negative predictive values for N LE urine dipsticks were calculated using the formula described by Lohr[11]).;

Sensitivity = true positive test/ true positive test + false negative test = high total positive/low total negative.

Specificity = true negative test/ true negative test + false positive test = high total negative/low total positive.

Positive predictive value = true positive test/true positive test + false positive test.

Negative predictive value = true negative test/true negative test + false negative test.

All children with positive urine cultures were treated with the appropriate antibiotic and their renal tract was evaluated by ultrasound scan (USS) to exclude at least any major structural abnormalities.

Statistics

Data entry and analysis was done using the software program Statistical Package for Social Science (SPSS) version 18. Descriptive statistics used comprised :mean, standard deviation (SD) ± and percentages. The comparative statistics were chi-square test and Students t-test. Statistical significance was defined at $P < 0.05$.

Ethical clearance:

Ethical clearance was obtained from the Ethical Committee in Sudan Medical Specialization Board and Soba Hospitals Research Committee. An informed consent was obtained from all children's parents and from schools administrations.

Results

In this study 345 school children from Arkaweet area in Khartoum State were enrolled. Girls were 200 (58%) and boys were 145 (42%). The age distribution of the study group is shown in table

1. Significant bacterial growth was documented in 9 (7 girls and 2 boys) out of 345 children. The overall prevalence of ABU was 2.6% (9/345). The prevalence in girls was 3.5% (7/200) and in boys 1.6% (2/145). The urine culture isolates were *Cedecea davisae* in three children (33.3%), *Staphylococcus aureus* in two (22.2%) and *E. coli, Proteus mirabilis, Citrobacter, Providencia rettgeri* in one child each (11.1%) as shown in table 2. The antibiotic sensitivity of the pathogens was high to *Ceftriaxone* (88.9%), *Cefixime* (77.9%) and *Gentamycin* (77.8%), moderate to *Cephelexin* (44.1%), and low to *Co-trimoxazole* (33.3%) and *Nalidixic acid* (11.1%) (Table 4). There were no significant association between occurrence of ABU and different risk factors including : parents level of education, constipation, intestinal worm infestations, gender or age (P = 0.525, 0.313, 0.847, 0.891 and 0.604 respectively).

The LE and N dipstick tests had low sensitivity (22.25% & 11.1% respectively) but high specificity (98.8% & 99.9% respectively). LE and N tests had low positive predictive value (33.3% & 25% respectively), but high negative predictive value (97.9% & 97.6% respectively). When tests were used in combination, sensitivity and positive predictive value were low (20% & 50% respectively) but specificity and negative predictive value were high (99.9% and 97.7% respectively).

Table1. Age distribution of children in the study group (n = 345)

Age (years)	Number	Percentage (%)
6- 10	186	54
11- 14	159	46
Total	345	100

Table 2. Urine culture bacterial isolates (n = 9)

Organism	Number	Percentage (%)
Cedecea davisae	3	33.3
Staphylococcus aureus	2	22.2
Escherichia coli	1	11.1
Proteus mirabilis	1	11.1
Citrobacter	1	11.1
Providencia rettgeri	1	11.1
Total	9	100.0

Table 3. Sensitivity, specificity, positive and negative predictive values of urine dipstick test: Leukocyte esterase and Nitrite tests (LE and N)

Dipstick test	Sensitivity	Specificity	Predictive Value	
			Positive	Negative
Leukocyte esterase (LE) test	22.2%	98.8%	33.3%	97.9%
Nitrite test (N)	11.1%	99.1%	25%	97.6%
Both tests (LE & N)	20%	99.9%	50%	97.7%

Table 4. The antimicrobial sensitivity pattern of urine culture isolates

Drug	Highly Sensitive	Moderately sensitive	Resistant
Ceftriaxone	8 (88.9%)	1 (11.1%)	-
Cefixime	7 (77.9%)	2 (22.2%)	-
Gentamycin	7 (77.9%)	-	2 (22.2%)
Cephelexin	4 (44.4%)	1 (11.1%)	2 (22.2%)
Co-trimoxazole	3 (33.3%)	2 (22.2%)	3 (33.3%)
Nalidixic acid	3 (33.3%)	1 (11.1%)	4 (44.1%)

Discussion

Studies on screening for asymptomatic bacteriuria (ABU) were done with the assumption that early detection of infection and adequate management could lead to prevention of kidney damage. However, reports from comprehensive, long-term screening programs for bacteriuria in school girls showed no conclusive evidence of progressive renal scarring or failure with untreated ABU[12]. A randomized, controlled trial showed no difference in outcomes between antibiotics treatment versus no treatment over two years[13]. Many patients with ABU who have symptoms of UTI when interviewed closely may have recurrent symptomatic bacteriuria. This study showed that the overall prevalence of ABU in school children (aged 6-14 years) was 2.6% being higher in girls than boys (3.5% versus 1.6% respectively). Other studies have shown variable prevalence rates of ABU among different populations. Many earlier studies from different parts of the world have reported lower prevalence rates than ours: Nepal (1.39%), Malaysia (0.12%), and Turkey (0.37%) [8, 14, 15]. Canadian Task Force on Preventive Healthcare has also shown a lower prevalence with predominance of females: (0.026% for males, 1.1% - 2.4% for females) [1]. In this study, predominance of females over males was demonstrated (3.5% in females and 1.6% in males). However, a report in

Japan showed a lower prevalence but no gender difference (0.6% in boys, 0.52% in girls) [16]. In contrast, higher prevalence of ABU than ours were reported from three different Nigerian (7.2%, 9.7% and 35.5%) studies [6,7,17] respectively] and an Indian study (16.5%) [18]. These variations in prevalence of ABU could be related to factors such as : using different methods of diagnosis and the different socioeconomic levels. In this study, a repeat urine culture for the positive cases might have resulted in a lower prevalence of ABU. The species of *Enterobacteria* ,especially *E. coli* and other gram negative bacteria , were reported to be the most common pathogens in ABU in school children[7,8] . In many studies , the rates of isolation of E coli organisms in ABU were variable (9.7%- 56.8%) [7,8, 16,17,19]. However, other studies reported non- E. coli organisms as the commonest pathogens[7, 17]. N*on-E coli* organisms were isolated with variable rates in different studies; *Staphylococcus aureus* (40.6%), *Strept. faecalis* (28%) *and Klebsialla species* (16.2%)[6, 17] . In this study, urine culture isolates were different from other studies with *non-E coli* organisms like *Cedecea davisae and Staphylococcus aureus* as the commonest pathogens (33.3% and 22.2% respectively). Less isolated pathogens were : *E. coli, Proteus mirabilis, Citrobacter and Providencia rettgeri* (11.1% each). *Cedecea species* is a group of organisms in the *Enterobacteria* that were isolated from clinical sources, including urine, by the Centers for Disease Control (CDC) in 1981. The clinical significance of these organisms is unknown[20]. Phenotypically, *Cedecea* resembles no other group of *Enterobacteriaceae*[20]

Many studies evaluated the accuracy of urine dipstick tests as rapid tests for bacteriuria and urinary tract infections (UTI). A meta-analysis concluded that urine dipsticks alone seem to be useful in all populations, including children, to exclude urinary infection if both tests (N and LE) were negative. Sensitivities of the combination of both tests were variable (68 and 88%), but positive test results have to be confirmed by culture[21]. In a cohort study with 18% prevalence of UTI, a negative results of LE and N in combination had a negative predictive value of 96%[22]. Urine dipsticks appear to be more accurate than microscopy for the detection of pyuria in children[22- 23] . But this remains debatable. In the present study, LE or N dipstick used alone had a low sensitivity and low positive predictive values but high specificity and high negative predictive value. When both tests were combined, the sensitivity and the positive predictive values remained low but specificity and negative predictive value were high (99.9% and 99.7% respectively). Therefore, negative results for both LE and N in combination can be used to exclude the presence of UT infection. Such findings and conclusions have been reported by many other investigators[22- 25] .

Conclusion

Higher and lower prevalence rates of ABU than ours were reported in other studies which could be related to the different methods of diagnosis. Unusual *non-E. coli* pathogens were common urinary pathogens in this population of school children in Khartoum State -Sudan which needs further verification. The high negative PV of urine dipsticks suggests their use in screening for ABU and ruling out UTI if the results of both tests (LE and N) are negative. However, urine culture is mandatory to confirm UTI diagnosis in those with positive dipsticks tests. Determining the prevalence of ABU among school children could help in taking measures to prevent later kidney damage especially in girls who tend to have more recurrent infections.

Acknowledgements

This work is part of a Thesis submitted for partial fulfillment of Clinical MD in Pediatrics, University of Khartoum (2012). Our thanks go to all the staff in the Microbiology Department for their help in performing the laboratory tests. Our thanks are extended to Health Statistics Department, University of Khartoum, for their help with data analysis.

Study Limitations

One limitation of this study was the relatively small

number of the study population compared to many other larger studies. Another limitation is that no re-check urine cultures were done for the positive cases as shown in some reports. This might have lowered our prevalence.

**The authors declare no conflict of interest

References

1. Smith MBH. Screening for urinary infection in asymptomatic infants and children. In: Canadian Task Force on the Periodic Health Examination. Canadian Guide to Clinical Preventive Health Care. Ottawa: Health Canada, 1994; 220-30.
2. Brooks D: The management of suspected urinary tract infection in general practice. *Br J Gen Pract* 1990; 40:399-402
3. Cochat P, Dubourg L, Koch Nogueira P, Peretti N, Vial M.French: Urine analysis by dipstick. *Arch Pédiatr* 1998; 5:65-70
4. Hoberman A, Wald ER, Penchansky L, Reynolds EA, Young S: Enhanced urinalysis as screening test for urinary tract infections in children. *J Pediatr* 1993; 91: 1196-1198
5. McLachlin MSF, Meller ST, Vemin Jones ER. Urinary tract infection in school girls with covert bacteriuria. *Arch Dis Child* 1973; 50:253
6. Iroezindu, I Egbuonu, CC Ezechukwu, JO Chukwuka Prevalence of asymptomatic bacteriuria among pre-school children in Nnewi, South-East Nigeria JC Elo-Ilo, MO *Nigerian Journal of Paediatrics* 2013;40: 278-83
7. ARC Nwokocha, FA Ujunwa, VO Onukwuli, HU Okafor N Onyemelukwe. Changing Pattern of Bacteriuria among Asymptomatic Secondary School Adolescents within Enugu South East *Nigeria Ann Med Health Sci Res.* 2014; 5: 728–732
8. Jha BK1, Singh YI2. Prevalence of asymptomatic bacteriuria in school going children in Pokhara valley. *Kathmandu University Medical Journal.* 2007; 5: 81-84
9. Collee JG, Fraser AG, Marmion BP, Simmons A. Mackie and McCartney Practical Medical Microbiology. 14th edition. Churchill Livingstone, 1996:86-88.
10. Muñoz P[1], Cercenado E, Rodríguez-Créixems M, Díaz MD, Vicente T, Bouza E. The CLED agar option in urine culture routine. A prospective and comparative evaluation. *DiagnMicrobiol Infect Dis*. 1992; 15:287-90.
11. Lohr JA. Use of routine urinalysis in making presumptive diagnosis of urinary tract infection in children. *Paediatr Infect Dis J* 1999; 10: 646-650.
12. Newcastle Covert Bacteriuria Research Group. Covert bacteriuria in schoolgirls in Newcastle upon Tyne: a five year follow-up. *Arch Dis Child* 1981; 56:585–592.
13. Hansson S, Caugant D, Jodal U, Svanborg-Eden C. Untreated asymptomatic bacteriuria in girls: Stability of urinary isolates. *BMJ* 1989; 298:853–855.
14. Zainal D, Baba A. Screening for bacteriuria in Malaysian school children. *Singapore Med J* 1994 Aug: 35: 374-5.
15. Yayli G[1], Yaman H, Demirdal T Asymptomatic bacteriuria rates in schoolchildren: results from a rural city in Turkey. *J Trop Pediatr*. 2003; 49:228-230.
16. Iitaka K, Sakai T, Oyama K, et al. Screening for bacteriuria in Japanese school children. *Acta Paediatr Jap* 1990; 32: 690-695.
17. E. O. Dada, C. E. Aruwa. Asymptomatic Bacteriuria Prevalence among Primary School Children in the Federal University of Technology, Akure (Futa), Ondo State, Nigeria *Journal of Applied Life Sciences International* 2016; 4: 1-8

18. Kondapaneni SL, Surpam R, MohdAzaruddin, Devi G. Screening for asymptomatic bacteriuria in school-going children. *Indian J Public Health.* 2012; 56:169-170

19. Wogu M D, Ogbebor N E. Prevalence of Asymptomatic Bacteriuria in Secondary School Students in Benin City International *An International Multidisciplinary Journal, Ethiopia* 2011; 4:145-151

20. Grimont PAD,' Grimont F,' Farmer III JJ, and Asbury' MA. Cedeceadavisae gen. nov., sp. nov.andCedecealapagei sp. nov., New Enterobacteriaceae from Clinical Specimens. *Int JSystBacteriol* 1981; 31: 317-326.

21. Walter LJM Devillé, Joris C Yzermans, Nico P van Duijn, P Dick Bezemer, Daniëlle AWM van der Windt, Lex M Bouter. The urine dipstick test useful to rule out infections. A meta-analysis of the accuracy *BMC Urology* 2004, 4:4 doi:10.1186/1471-2490-4-4

22. Bulloch B, Bausher JC, Pomerantz WJ, Connors JM, Mahabee-Gittens M, Dowd MD. Can urine clarity exclude the diagnosis of urinary tract infection? *Pediatrics*. 2000; 106: E60.

23. Gorelick MH, Shaw KN. Screening tests for urinary tract infection in children: a meta-analysis. *Pediatrics*. 1999; 104 :E54.

24. Shareif N, Hameed M, Petts D et al. Use of rapid dipstick tests to exclude urinary tract infection in children. *Br J Biomed Sci* 1998; 55:26-42

25. Ali M El-Shafie, Fathia M. El-Nemr, Mohamed H. Bahbah, Mohamed Shokry, Ahmed attia. The Role of Urine Screening in School Children of Menoufiya Governorate in early detection of renal disorders.*J of Am Sci* 2014; 10:143-150

Hyperinsulinemic response to oral glucose in obese patients with essential hypertension

*N. A. Alaagib[1], M.Y. Sukkar [2], M.M. Kardash [3].

[1] *Department of Physiology, Faculty of Medicine, University of Khartoum.*

[2] *Nile College.*

[3] *Omdurman Ahlia University.*

Abstract

Background and objectives: Hypertension is a common health problem. The prevalence of hypertension increases progressively with increasing Body Mass Index. The aim of this study is to investigate changes in blood pressure (BP), plasma glucose (PG) and insulin level after ingestion of oral glucose; and to assess the relation between insulin level and BP in obese and non-obese normo-tensive and hypertensive subjects.

Materials and Methods: Seventy five g glucose dissolved in 250 ml of water was given orally to 20 fasting newly diagnosed untreated patients with essential hypertension and 15 normo-tenisve control subjects matched for age, gender and Body Mass Index (BMI). Smokers and subjects with diabetes, hyperlipidemia, cardiac or renal disease or those taking medications were excluded. Subjects were monitored for 2 hours. Half hourly BP, PG and insulin were measured.

Results: Subjects were classified into obese (BMI≥ 30 Kg/m2) (11 patients, 8 normo-tensives) and nonobese (BMI< 30 Kg/m2) (9 patients, 7 normo-tensives). In obese hypertensive patients, insulin showed significant positive correlation with: systolic BP (SBP) (P=.04), diastolic BP (DBP) (P=.04) and mean BP (MBP) (P=.03). Obese hypertensive patients showed a significantly higher insulin response to oral glucose than obese normo-tensive subjects (P=.02).

In obese and non-obese hypertensive patients glucose intake was associated with significant drop in DBP ((P≤ .005), (P< .05)) and MBP ((P< .005), (P< .05)) respectively.

Conclusions: In obese hypertensive patients, the hyperinsulinemic response to oral glucose and the positive correlation of insulin with BP suggest that insulin may be involved in development of essential hypertension especially in obese patients.

***Corresponding author:** *Deparment of Physiology, Faculty of Medicine -University of Khartoum. e-mail nouralsalhin@gamil.com*

Introduction

More than 25% of the world adult population has hypertension [(1)]. Prevalence of hypertension increases progressively with increasing BMI [(2)]. The exact mechanisms for the development of essential hypertension are not known. Now it is generally accepted that genetic and environmental factors contribute equally to development of hypertension [(3)]. Among the environmental factors, dietary factors seem to have a prominent role in blood pressure (BP) homeostasis. Each meal initiates a series of integrated physiological events, which facilitate digestion and absorption of nutrients. It is also associated with haemodynamic, hormonal and electrolyte changes that can affect the BP in hypertensive and normo-tensive subjects.

There is some controversy about the hemodynamic responses to oral ingestion of glucose in normo-tensive and hypertensive subjects. A significant increase in BP following glucose intake was

reported in normo-tensive subjects[4,5] and in hyper-insulinemic, but not in normo-insulinemic hypertensive patients [5]. It is not known whether the effect of glucose on elevation of BP is higher in hypertensive subjects or in subjects with normal BP [6]. Some studies reported a significant decrease in BP after ingestion of glucose load in hypertensive patients [7-9]. It was suggested that insulin may not be directly involved in the pathogenesis of postprandial hypotension[9]. Postprandial hyperinsuliemia has been found in patients with mild essential hypertension[10].

The aim of this study is to compare changes in BP, plasma glucose (PG) and insulin levels after ingestion of an oral glucose load and to assess the relation between insulin level and BP in obese and non-obese normo-tensive and hypertensive subjects. This study may contribute to the understanding of the pathophysiology of essential hypertension taking into consideration the BMI of the patients and controls. Results of this study may throw new light on the rationale of dietary management of patients with essential hypertension regarding sugar intake.

Methods:

This is a short-term experimental study including 20 newly diagnosed untreated adult patients with essential hypertension, and 15 normo-tensive control subjects matched for age, gender, and BMI. Sample size was calculated using the formula for experimental study with serial samples:

$n=1+2C(s/d)^2$, Equation2
(SnedecorandCochran1989) [11]

Subjects with BP $\geq$ 140/90 were considered as hypertensive patients [12]. Blood pressure was measured using mercury sphygmomanometer (Kawamoto, Japan), according to the standardized methodology [12].

Hypertensive patients were recruited from primary health care centers. After screening visits to identify and select newly diagnosed cases of essential hypertension, patients signed an informed consent form approved by the Ethical Committee of Faculty of medicine, University of Khartoum and filled a questionnaire including: personal data and medical history. Complete physical examination and electrocardiogram (ECG) were done to the patients and control subjects. Known hypertensive patients, smokers, alcoholics, and subjects with hyperlipidemia, diabetes mellitus or with random blood glucose more than 200 mg/dl were excluded. Patients with mandatory reason for immediate initiation of treatment e. g. very high blood pressure, target organ damage, were also excluded. Weight in (Kg) and height in meters (M) were measured using standardized scale (Seca, Germany). The BMI in kg/m^2 was calculated as a ratio between body weight (kg) and squared height (m^2). Random blood glucose, urea, creatinine, lipid profile (Biosystem, Spain) were measured by spectrophotometer for each subject to exclude any abnormality.

Patients were advised to continue their normal dietary habits and not to restrict their usual carbohydrates intake. On the day of the experiment the selected subjects fasted overnight (8- 10 hrs). Water was allowed, and they attended at the laboratory in the early morning. After resting for 15 minutes, a base line fasting BP and blood sample were taken. Then each subject took 75gm glucose solution dissolved in 250 ml of water to be consumed in not more than 5 minutes. Each subject was monitored for 2 hours. Half hourly BP measurements and venous blood samples were taken to measure plasma glucose using glucose oxidase method (Biosystem, Spain) by spectrophotometer and serum insulin by quantitative immunoassay test kits (Immunospec, USA) using ELISA (Enzyme Linked Immunosorbent Assay) technique.

All BP measurements were done in the sitting position by the same investigator in a quiet office with comfortable room temperature. A larger cuff was used for measurement of BP in obese patients. SBP was taken as the point of onset of the auscultated pulsation (phase 1), and DBP was the point before the disappearance of the sounds (phase 5). Three readings were taken by the same investigator at intervals of at least 1 minute, and the

average of those readings was used for statistical analysis. If there is >5 mm Hg difference between readings, an additional reading was obtained, and then the average of all the readings was used[13].

Results obtained were saved and analyzed using the Statistical Package Program for Social sciences (SPSS) version 17. Descriptive statistics were done for all variables. The relation between BP, plasma glucose and serum insulin was tested with Pearson correlation. Comparison of the above variables between hypertensive and control subjects was done with independent student *t*-test. To determine changes in BP, plasma glucose and insulin following intake of glucose paired samples T- test was done.

Results:

This study included 20 patients with essential hypertension: 11 were obese (BMI≥ 30Kg/m^2) and 9 were non-obese patients (BMI< 30Kg/m^2) [14]. The normo-tensive control group included 15 subjects matched for age, gender and BMI; 8 were obese and 7 were non-obese subjects.

To assess BP responses to oral glucose, comparison of each of the 4- half- hourly samples with the baseline BP (fasting BP at 0 minute) was done using paired sample T- test in obese and non-obese hypertensive patients and normo-tensive control subjects (table 1).

Table: Changes in plasma glucose, serum insulin& blood pressure after intake of oral glucose

Variable	Time min.	Nonobese patients Mean± S.E (n=9)	Paired T-test P value	Obese patients Mean± S.E (n=11)	Paired T-test P value
Systolic Blood Pressure (SBP)	0	153.0 ±5.2		149.9± 4.6	
	30	150.95 ±5.2	.47	146.6± 4.6	.209
	60	149. 85 ±5.2	.27	146.3± 4.6	.247
	90	150.75 ±5.2	.49	145.4± 4.6	.179
	120	148.55.2±	.18	144.5± 4.6	.147
Diastolic Blood Pressure (DBP)	0	100.7± 5.7		98.7 ±5.0	
	30	95.2± 5.7	.009*	92.4 ±5.0	.003*
	60	94.3 ±5.7	.009*	92.5± 5.0	.004*
	90	94.9± 5.7	.03*	92.5± 5.0	.005*
	120	95.9± 5.7	.03*	92.4± 5.0	.002*
Mean Blood Pressure (MBP)	0	118.1 ±5.4		115.9 ±4.8	
	30	114.1 ±5.4	.08	110.5 ±4.8	.008*
	60	112.7± 5.4	.03*	110.4 ±4.8	.02*
	90	113.3 ±5.4	.09	110.0 ±4.8	.01*
	120	113.3 ±5.4	.06	110.0 ±4.8	.009*

*P is significant at <0.05

Following the intake of oral glucose load, the DBP decreased significantly in both obese (P≤ .005) and non-obese hypertensive patients (P< .05) at 30 minutes and continued throughout the 2 hour period of follow up (table 1). SBP did not show significant changes in any of the hypertensive groups. In non-obese hypertensive patients, a significant drop in MBP occurred only at 60 minutes (P= .03). In obese patients Mean BP also dropped significantly by about 5 mmHg throughout the period of follow up (P< .05) (table 1).

At baseline fasting, insulin was significantly higher in obese hypertensive subjects than obese normo-tensive control subjects (P=.02) with no significant difference in fasting blood glucose. After intake of glucose, the plasma glucose and serum insulin increased significantly in all groups. However, the mean of insulin levels in response to oral glucose intake in obese hypertensive patients was significantly higher than obese normo-tensive subjects (P=.02), despite no significant differences in plasma glucose between hypertensive and normo-tensive subjects (figures 1 & 2). Obese hypertensive patients showed a significantly higher insulin glucose ratio (0.55) compared to obese normo-tensive subjects (0.35) (P=0.009) (table 2). However, there was insignificant statistical difference in insulin glucose ratio in non-obese hypertensive patients and their matched normo-tensive control subjects (P=0.08).

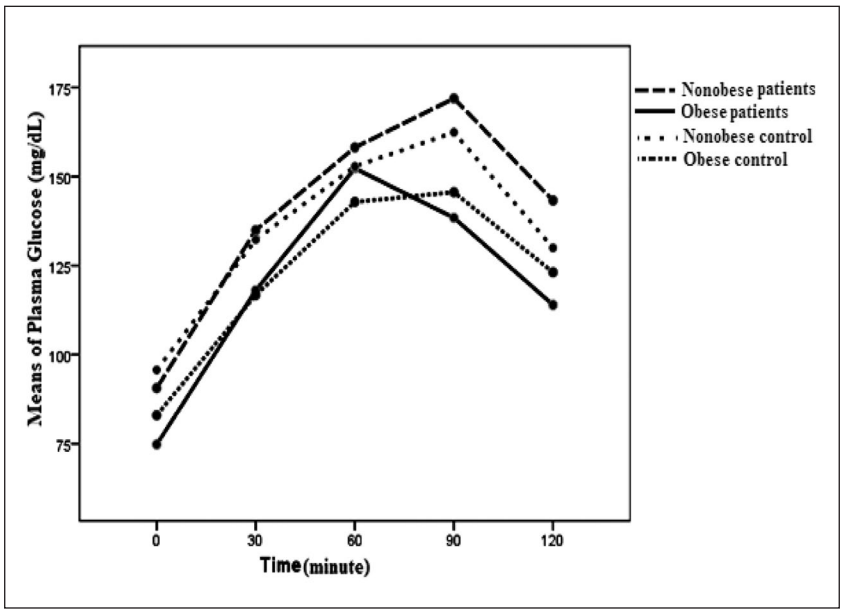


Figure 1. Plasma glucose in obese and non-obese hypertensive and normo-tensive subjects after oral glucose

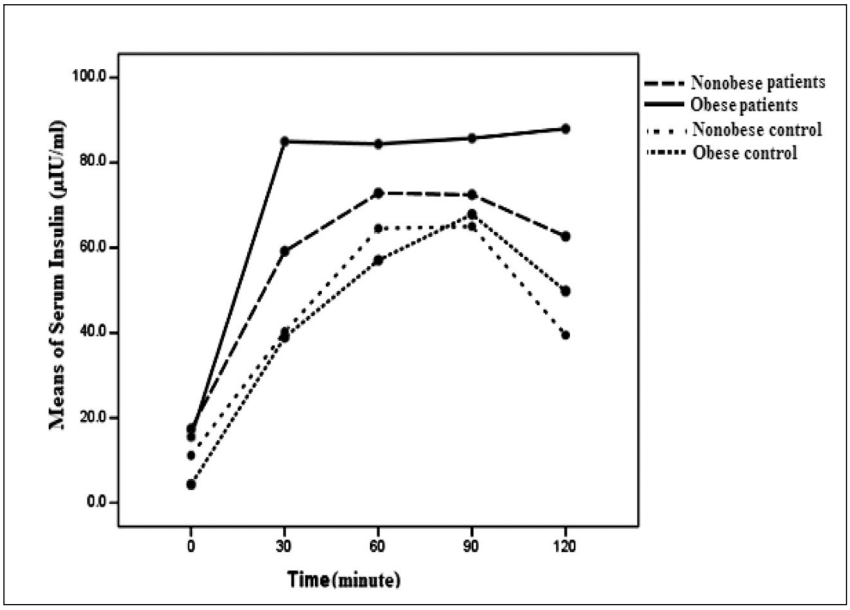


Figure 2. Serum insulin in obese and non-obese hypertensive and normo-tensive subjects after oral glucose

Table 2. Means of the variables for hypertensive patients and control subjects.

Variables (mean± SE)	Obese Patients	Obese Control	Nonobese Patients	Nonobese Control
BMI (Kg/m2)	33.4±0.4	35.6±0.9	25.3±0.3	25.4±0.3
MBP (mmHg)	113±2.2	91.5±1.1	111.9±1.5	91.8±1.4
Blood Glucose (mg/dL)	126.7±4.8	131.1±4.8	129.7±6.2	125.7±5.8
Serum Insulin (µIU/ml)	71.7±7.8	48.8±4.2	54.2±5.8	41.8±4.1
Insulin/Glucose ratio	0.55	0.35	0.40	0.32

* The means for MBP, blood glucose and serum insulin were calculated from the 5 half hourly samples for patients and control subjects.

In obese hypertensive patients insulin levels showed significant positive correlation with: SBP (P=.04), DBP (P=.04) and MBP (P=.03). This association was insignificant in normo-tensive subjects and non-obese hypertensive patients.

Discussion:

BP response to oral glucose load:

In this study, we found that DBP and MBP decreased significantly in both obese and non-obese hypertensive subjects following oral glucose intake which is comparable to previous studies[7-9]. It has been reported that the SBP and DBP decreased significantly during oral glucose tolerance test (OGTT) in hypertensive patients but not in normo-tensive subjects[7]. However, in our study the change in SBP was not significant in hypertensive or normo-tensive control subjects. In normo-tensive subjects we found that the changes in SBP, DBP and MBP were not significant. Similar results were reported in lean healthy young subjects after ingestion of 60 g glucose dissolved in 500 ml of water [15]. Contradictory results were found in other studies that reported increases in SBP in normo-tensive subjects after OGTT [5] and after intake of 100 g glucose [4]. In this study, the BP did not change significantly in normo-tensive subjects. This could be explained by the counteracting effects of the increasing insulin level after glucose ingestion causing both vasodilatation and increased sympathetic discharge which resulted in increased heart rate and stroke volume [16]. It has been found that acute increases in plasma insulin within the physiological range elevated sympathetic neural outflow, produced forearm vasodilatation but did not elevate arterial pressure in normo-tensive humans [16]. Scott et al reported that physiological insulinaemia following ingestion of a carbohydrate meal in healthy subjects was associated with overriding skeletal muscle vasodilatation, despite an increase in sympathetic vasoconstrictor discharge to the same vascular bed. The vasodilatation preceded the increase in sympathetic activity, and the time of the increase in muscle sympathetic nerve activity corresponded to the return of BP towards baseline values [17]. We found that obese hypertensive patients had significantly higher insulin level than their normo-tensive control subjects. It has been shown that the vasodilatation caused by insulin occurs early compared with the sympathetic activation [17]. Our results showed that the DBP and MBP decreased significantly in both obese and non-obese hypertensive subjects following OGTT can be explained by the vasodilatory effect of the high level of insulin which may be followed later by exaggerated sympathetic discharge leading to higher BP. We suggest that the disturbance in the balance of vasodilator and vasoconstrictor action of insulin may be one of the causes of high BP in obese hypertensive patients. However, the possibility of ethnic genetic differences cannot be excluded.

Insulin & BP in hypertensive patients:

In obese hypertensive patients, we found that serum insulin had significant positive correlation with: SBP, DBP and MBP after intake of glucose. Obese hypertensive subjects also showed significantly higher fasting and post-load insulin levels and higher insulin glucose ratio compared with obese normo-tensive subjects without a significant difference in plasma glucose. Xun et al [18] reported that fasting serum insulin levels or hyperinsulinemia in young adulthood was positively associated with incidence of hypertension later in life. It was suggested that fasting insulin may help clinicians to identify those at high risk of developing hypertension. The Diabetes Prevention Program Research Group [19] found that there was a weak, but significant, association between BP and insulin, proinsulin and insulin resistance (IR) which can be largely explained by overall adiposity.

Levin et al found that high serum glucose and insulin levels were associated with increased risk of the incidence of hypertension in community-based cohort. They suggested that these associations were independent of adiposity and other established hypertension risk factors as the magnitudes of association were attenuated by 50% after adjustment for serum cystatin C concentration, urinary albumin/creatinine ratio, and arterial elasticity measured by tonometry. They suggested that hyperglycemia and hyperinsulinemia contribute to hypertension in the absence of clinical diabetes, in part by damaging the kidney and arterial wall [20]. Hyperglycemia may damage the kidney and the arterial wall through deposition of advanced

glycation end products, generation of reactive oxygen species, and activation of protein kinase C [21, 22]. Furthermore, hyperinsulinemia stimulates the sympathetic nervous system and the renin-angiotensin- aldosterone system, which may lead to kidney and vascular damage [23, 24]. Mendizapal et al have clarified the possible pathophysiology of IR and its relationship to development of hypertension [25]. A number of proposed mechanisms caused by compensatory hyperinsulinemia associated with IR have been suggested as causes of hypertension. Insulin affects the BP through its direct cardiovascular effects as well as its systemic actions affecting the sympathetic nervous system and kidneys. Insulin increases cardiac contractility [26], increases cardiac output [27], stimulates secretion of the vasoconstrictor ET-1 from vascular endothelium and stimulates vascular smooth muscle cells proliferation and pro-inflammatory activity [28-30]. IR is associated with increased systemic and vascular inflammatory responses and oxidative stress, which may contribute to vascular dysfunction [31]. Insulin also activates the sympathetic nervous system [17] and can increase blood volume by increasing renal sodium retention [32, 33].

Contradictory results were reported by Akanji et al [34] who did not find any association between insulin level and BP in hypertensive or their age- and sex-matched healthy normo-tensive subjects at any time following a standard 75 g OGTT. Savage et al [35] voiced doubt about a direct role of insulin in the short-term regulation of BP. In non-obese normo-tensive and hypertensive subjects we did not find significant association between insulin and BP. Similar results were observed by Baba et al [36] who did not find an association between hyperinsulinemia and elevated BP after OGTT in non-obese middle-aged patients with essential hypertension and their normo-tensive control subjects.

We suggest that most of the studies which failed to detect an association between insulin and BP, investigated the hypertensive and their matched normo-tensive control subjects as one group matched for age and gender and did not take BMI and obesity into consideration. In this study, obese hypertensive patients showed higher insulin levels and the insulin levels correlated directly with BP after intake of glucose. In the non-obese, whether hypertensive or not, we did not find association between insulin and BP. We suggest a link between high BP and elevated insulin. However, to determine whether it is a cause or effect will need further investigation by cohort studies. Our results confirm the old hypothesis that obesity or the metabolic syndrome, especially associated with abdominal obesity, is the link between hypertension and hyperinsulinemia.

Conclusions

The findings from the current study point to the fact that the metabolic, hormonal and BP responses to glucose are highly inter-correlated. Thus, the time and constituents of the last meal prior to BP measurement should be taken into consideration especially when diagnosing hypertension or conducting research on hypertension. The higher insulin response to oral glucose load observed in obese hypertensive patients and the associated acute significant drop that occurred in DBP suggest that the disturbed balance between vasodilator and the well-documented delayed vasoconstrictor sympathetic response caused by high insulin, may play a role in pathophysiology of hypertension especially in obese patients.

Acknowledgment: We would like to thank the Ministry of Higher Education – Sudan for funding this work.

Conflicts of interest: No Conflicts of interest in this study.

References:

1. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. *Lancet*. 2005;365:217-23.

2. Ong KL, Cheung BM, Man YB, Lau CP, Lam KS. Prevalence, awareness, treatment, and control of hypertension among United States

adults 1999-2004. *Hypertension*. 2007;49:69-75.

3. Butler MG. Genetics of hypertension. Current status. *J Med Liban*. 2011;58:175-8.

4. Berne C, Fagius J, Niklasson F. Sympathetic response to oral carbohydrate administration. Evidence from microelectrode nerve recordings. *J Clin Invest.* 1989;84:1403-9.

5. Muscelli EO, Abdalla Saad MJ, Rocha Gontijo JA. Insulinemia and blood pressure responses to oral glucose load in primary hypertensive patients. *Cardiology.* 1991;79:14-9

.6. von Känel R NR, Le DT, Ziegler MG, Dimsdale JE. Decrease in the plasma von Willebrand factor concentration following glucose ingestion: the role of insulin sensitivity. *Metabolism*. 2001;50:1452- 6.

7. Karcier SM, Caner M. Changes of Blood Pressure and its Relation with Plasma Glucose and Insulin Concentration During Oral Glucose Tolerance Test in Patients with Essential Hypertension. *Turk Soc Cardio*l 1993;21:286-9.

8. Narkiewicz K, Rynkiewicz A, Furmanski J, et al. Plasma insulin and blood pressure response to oral glucose tolerance test in young borderline hypertensives. *Mater Med Pol.* 1993;25:23-6.

9. Mitro P, Feterik K, Lenartova M, Cverckova A, et al. Humoral mechanisms in the pathogenesis of postprandial hypotension in patients with essential hypertension. *Wien Klin Wochenschr*. 2001;113:424-32.

10. P Singer, W Gödicke, S Voigt, I Hajdu, Weiss M. Postprandial hyperinsulinemia in patients with mild essential hypertension. *Hypertension.* 1985;7:182-6.

11. Dell RB, Holleran S, Ramakrishnan R. Sample size determination. *ILAR J.* 2002;43:207-13.

12. Chobanian AV, Bakris GL, Black HR, et al. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Hypertension*. 2003;42:1206-52.

13. Pickering TG, Hall JE, Appel LJ, et al. Recommendations for blood pressure measurement in humans and experimental animals: part 1: blood pressure measurement in humans: a statement for professionals from the Subcommittee of Professional and Public Education of the American Heart Association Council on High Blood Pressure Research. *Circulation*. 2005;111:697-716.

14. WH O. Obesity and Overweight. World Health Organization Global strategy on Diet, Physical activity and Health. 2014. http://www.who.int/mediacentre/factsheets/fs311/en/. [accessed 6 Decembert 2016].

15. Brown CM, Dulloo AG, Yepuri G, Montani JP. Fructose ingestion acutely elevates blood pressure in healthy young humans. *Am J Physiol Regul Integr Comp Physiol*. 2008;294:R730-7.

16. Anderson EA, Hoffman RP, Balon TW, Sinkey CA, Mark AL. Hyperinsulinemia produces both sympathetic neural activation and vasodilation in normal humans. *J Clin Invest.* 1991;87:2246-52.

17. Scott EM, Greenwood JP, Vacca G, Stoker JB, Gilbey SG, Mary DA. Carbohydrate ingestion, with transient endogenous insulinaemia, produces both sympathetic activation and vasodilatation in normal humans. *Clin Sci (Lond).* 2002;102:523-9.

18. Xun P, Liu K, Cao W, Sidney S, Williams OD, He K. Fasting insulin level is positively associated with incidence of hypertension among American young adults: a 20-year follow-up study. *Diabetes Care*. 2012;35:1532-7.

19. Diabetes, Prevention, Program, Research, Group. Hypertension, insulin, and proinsulin in participants with impaired glucose tolerance. *Hypertension*. 2002;40:679-86.

20. Levin G, Kestenbaum B, Ida Chen YD, et al. Glucose, insulin, and incident hypertension in

the multi-ethnic study of atherosclerosis. *Am J Epidemiol*. 2010;172:1144-54.

21. Brownlee M. The pathobiology of diabetic complications: a unifying mechanism. *Diabetes*. 2005; 54:1615-25.

22. Ceriello A. Controlling oxidative stress as a novel molecular approach to protecting the vascular wall in diabetes. *Curr Opin Lipidol*. 2006 ;17:510-8.

23. Sowers JR, Epstein M. Diabetes mellitus and associated hypertension, vascular disease, and nephropathy. An update. *Hypertension*. 1995 ;26:869-79.

24. Durvasula RV, Shankland SJ. The renin-angiotensin system in glomerular podocytes: mediator of glomerulosclerosis and link to hypertensive nephropathy. *Curr Hypertens Rep.* 2006 ;8:132-8.

25. Mendizabal Y, Llorens S, Nava E. Hypertension in metabolic syndrome: vascular pathophysiology. *Int J Hypertens*.2013:ID230868.

26. von Lewinski D BS, Walther S, Kögler H, Pieske B. Insulin causes [Ca2+]i-dependent and [Ca2+]i-independent positive inotropic effects in failing human myocardium. *Circulation*. 2005;24:2588-95.

27. Baron AD, Brechtel-Hook G, Johnson A, Hardin D. Skeletal muscle blood flow. A possible link between insulin resistance and blood pressure. *Hypertension.* 1993;21:129-35.

28. Cardillo C, Nambi SS, Kilcoyne CM, Choucair WK, Katz A, Quon MJ, et al. Insulin stimulates both endothelin and nitric oxide activity in the human forearm. *Circulation.* 1999;100:820-5.

29. Ferri C, Pittoni V, Piccoli A, et al. Insulin stimulates endothelin-1 secretion from human endothelial cells and modulates its circulating levels in vivo. *J Clin Endocrinol Metab*. 1995;80:829-35.

30. Schulman IH, Zhou MS. Vascular insulin resistance: a potential link between cardiovascular and metabolic diseases. *Curr Hypertens Rep*. 2009 ;11:48-55.

31. Zhou MS, Schulman IH, Raij L. Vascular inflammation, insulin resistance, and endothelial dysfunction in salt-sensitive hypertension: role of nuclear factor kappa B activation. *J Hypertens*. 2010 ;28:527-35.

32. Horita S, Seki G, Yamada H, Suzuki M, Koike K, Fujita T. Insulin resistance, obesity, hypertension, and renal sodium transport. *Int J Hypertens*. 2011;2011:391762.

33. Manhiani MM, Cormican MT, Brands MW. Chronic sodium-retaining action of insulin in diabetic dogs. *Am J Physiol Renal Physiol*. 2011 ;300:F957-65.

34. Akanji AO, Ojule AC, Kadiri S, Osotimehin BO. Plasma glucose and insulin responses to oral glucose loading in nonobese Nigerian subjects with essential hypertension. *J Natl Med Assoc*. 1993;85:267-72.

35. Savage MW, Mohamed-Ali V, Williams G. Suppression of post-glucose hyperinsulinaemia does not affect blood pressure in either normotensive or hypertensive subjects. *Clin Sci (Lond)*. 1998;94:609-14.

36. Baba T, Kodama T, Tomiyama T, Fujita N, Takebe K. Hyperinsulinemia and blood pressure in non-obese middle-aged subjects with normal glucose tolerance. *Tohoku J Exp Med*. 1991;165:229-35.

Prevalence of intestinal parasites, associated risk factors and social background of street children in Khartoum State, Sudan

Abdelmoneim E. M. Kheir*[1], Nagwa S. Abubaker [2]

[1]*Department of Paediatrics and Child Health, Faculty of Medicine, University of Khartoum and Soba University Hospital,*

[2]*Department of Paediatrics. Elfashir Teaching Hospital*

Abstract

Background: The magnitude of the problem of homeless children or "street children" is escalating and this is related to increasing levels of poverty especially in developing countries.

Objectives: The aims of this study were to estimate the prevalence of intestinal parasites and associated risk factors among street children.

Methods: This was a descriptive, cross- sectional study conducted in Khartoum State during the period Ist June 2013 to Ist December 2013. Two hundred and seven street children were included in the study. Data collected included :socio-demographic characteristics and stool analysis.

Data was analyzed using Statistical Package for Social Sciences (SPSS). Chi square test was used for correlation between risk factors and abnormal stool result.

Results: Males were 187(90.3%) and females were 20(9.7%).Seventy two percent of the street children were illiterate. 89.4% of them were doing marginal jobs. Hundred fourty eight (71.7%) of the children had positive stool result. Seventy six (36.7%) were positive for Giardia lamblia, Thirty six (17.4%) were positive for Entamoeba histolytica, six(2.8%) were positive for Hymenolepis Nana. Correlation between source of drinking water and laboratory analysis of stool revealed significant association between source of drinking water and E. histolytica ($p = 0.017$) and also correlation between type of work and laboratory analysis of stool showed significant statistical correlation with Giardia lamblia infection ($p= 0.014$).

Conclusion: The study revealed high prevalence of intestinal parasitic infections among street children. Epidemiological information on the prevalence of various intestinal parasites among street children is very important to develop appropriate control strategies.

***Corresponding author:** Email: moneimkheir62@hotmail.com*

Introduction

Street children comprise members of a vulnerable class of society with less access to consistent healthcare. This increases their risk of exposure to intestinal parasites. There is no standard definition for street children. However, they are considered a "hard to reach population" because they are difficult for researchers to access. Such groups should be included in research plans in order to develop appropriate services as deemed necessary[(1)]. The problem of street children is growing at an alarming proportion worldwide[(2)]. Population estimates of street children are unreliable[(3)]. However, the United Nations Organization estimates the population of children on the streets worldwide to be at 150 million, with daily number rising. Out of these, twenty million are in Africa, forty million are in Latin America, about thirty million in Asia; and twenty-five million in other parts of the world[(4)].

This phenomenon is often attributed to multiple

factors including: economic stagnation, unequal distribution of wealth, lack of welfare and social services, AIDS, and civil wars. Children interviewed in the street often refer to their household's economic and family problems[5]. There is ,however, very limited literature that describes specifically the views and characteristics of the families of these children[6- 7].

Intestinal parasites cause considerable morbidity and mortality, especially in developing countries and they are more prevalent among people who have less access to health care services and with low socio-economic status[8]. Therefore, parasitic infections, including enteroparasitic infections, are more prevalent among street children than non-street children[9]. Previous similar studies in Africa have shown that parasitic infections among street children in Africa are caused by worms such as: Ascaris lumbricoides and schistosomes, and protozoa such as Giardia lamblia and Blastocystishominis[10]. Research has shown that an increasing number of children are suffering from malnutrition and poor health globally, due to ongoing wars and armed conflicts and the economic and infrastructural strains from these situations[11- 12]. The numbers of street children seen on the streets of Khartoum State, Sudan's capital city is estimated by UNICEF to have risen from 2,000 in 1978 to 25,000 in 1990[13].

There is paucity of research on the health of street children. They are difficult to access and engage poorly with health services; consequently, there is little epidemiological data on them.

The aims of this research were to estimate the prevalence of intestinal parasitic infection among street children in Khartoum State. In addition, we sought to describe risk factors associated with infection ,as well as, the socioeconomic backgrounds of these children.

Materials and methods

This was a descriptive, cross- sectional study conducted in Khartoum State, the capital of Sudan during the period 1/6/2013 to 1/12/2013. Two hundred and siven street children were included in the study. Inclusion criteria were street children aged 5 to 16 years in Khartoum State; those outside the age range and from other states were excluded from the study as well as those who refused to participate in the study. A snowball sampling technique was used to recruit eligible children.

Data was collected using a survey tool and only verbal consent was obtained as the majority of them were illiterate. Stool samples were collected from many random public toilet areas in Khartoum for analysis. Samples of street children were taken from the central part of Khartoum as the peripheries are not accessible and might pose dangers to the researchers. Data collected included : socio-demographic characteristics of these street children which included age, sex, origin, residence, family background and level of education. Other data collected included : risk factors for intestinal helminthes like source of food and drink, place of defecation.

Stool is passed in a public toilet nearby in a sterile container and then sent to the laboratory immediately without delay. Samples were analyzed in the Central Laboratory of Khartoum Teaching Hospital and they were done absolutely free of charge. Laboratory analysis included microscopic examination, chemical tests and microbiologic tests. The stool was also checked for color, consistency, weight (volume), shape, odor, helminthes and the presence of mucus and blood. Other tests done on the stool included occult blood, fat, meat fibers, bile, white blood cells.

No cultures were done for stool samples. Those found with abnormalities in their stool analysis were given appropriate treatment and advice.

Data was analyzed using SPSS, version 20. Frequency analyses for background variables was conducted. Chi square test was used for correlation between the risk factors and abnormal stool result. P value was set at 0.05 level of significance.

Ethical approval for conducting this research was obtained from the Ethical Committee of

Sudan Medical Specialization Board. Consent for participation was obtained from individual candidates.

Results

A total of 207 children were included in this study. The majority of them were males (90.3%) and females were 9.7%; most of the children were between the age group 11-15 years (60.9%) and only 6.8% were above the age of 16 years (Table 1).

Table 1. Demographic data

	Number	Percentage
Age range in years		
5-<11	67	32.3%
11-<16	126	60.9%
>16	14	6.8%
Total	207	100%
Gender		
Males	187	90.3%
Females	20	9.7%
Total	207	100%
Type of work		
Street venders	72	34.7%
Collecting empty plastic bottles	33	15.9%
Beggars	21	10.1%
Car washing	15	7.2%
Cleaning car windshields	19	9.1%
Porters	11	5.3%
Shoe polishing	9	4.3%
Water sellers	2	0.9%
Working with women selling tea	2	0.9%
Not working	23	11.1%
Total	207	100.0

Regarding education, 72% of the children were illiterates and 27% received basic school education. The present study showed that most of the children (74.4%) spend part of the day on the street while 25.6% spent the whole day on the street.

The study also revealed that more than half (58%) of the study sample do not live with their family and all came from crowded family background with an average of 10 members per family. The majority of the studied population work (89.4%): 34.75% work as street venders, 15.9% collect empty bottles, 10.1% are beggars, and 9.1% clean cars windshields.

Regarding the source of drinking water: all studied children (100%) drank untreated water available on the streets. The study also revealed that 61.4% of the children bought food from the street while 38.6% ate remnants of food from restaurants.

Regarding areas of defecation: 66.7% used public toilets while 33.3% defecated in open areas.

As for the method of cleaning themselves: 85% used water, 13% used papers while a minority (1%) didn't clean at all. The majority of children had positive stool result (71.7%). 36.7% were positive for Giardia lamblia, 17.4% positive for Entamoeba histolytica, 2.8% positive for Hymenolepis Nana, 8.6% had significant pus cells and 6.2% had significant RBCs (table2).

Table 2. Distribution of the sample size according to stool result

Stool result	Number	Percentage
G. lamblia	76	36.7
Entamoeba histolytica	36	17.4
H. nana	6	2.8
Pus cells	18	8.6
RBCS	12	6.2
Normal result	59	28.3
	207	100%

Further analysis of the stool samples showed that 22.2% of Giardia lamblia cases were trophozoites and 14.5% were cysts. Regarding Entamoeba histolytica 12.1% were trophozoites and 5.3% were cysts.

Correlation between source of drinking water and laboratory analysis of stool revealed significant association between source of drinking water and E. histolytica (p = 0.017); but insignificant with Giardia lamblia (p= 0.32), and H. nana (p= 0.8) (table 3).

Table 3. Corelation between source of drinking water and laboratory analysis of stool.

Result of stool analysis	source of drinking water		Total
	Street	Restaurant	
RBCs	6.30%	0%	6.30%
Pus cells	8.70%	0%	8.70%
Giardia lamblia	22.20%	0%	22.20%
E.histolytica	12.10%	0%	12.10%
H. nana	2.90%	0%	2.90%

E. histolytica (p = 0.017); Giardia lamblia (p= 0.32), and H. nana (p= 0.8).

The correlation between type of work (beggars and those who collect empty plastic bottles) and laboratory analysis of stool was statistically significant correlation with Giardia lamblia infection (p= 0.014), E. histolytica (p=0.03); but insignificant with H. nana (p=0.12). There was statistically significant association between place of defecation and H. nana (p=0.008) but not statistically significant with Giardia lamblia (p= 0.21) and E. histolytica (p=0.92) as shown in table (4).

Table 4. Corelation between place of defecation and result of stool analysis

Result of stool analysis	place of defecation		Total
	open area	Toilet	
RBCs	2.90%	3.38%	6.28%
Pus cells	2.90%	5.80%	8.70%
Gardia lamblia	7.25%	14.98%	22.23%
E.histolytica	4.35%	7.73%	12.08%
H. nana	2.42%	0.48%	2.90%

H. nana (p=0.008), Gardia lamblia (p= 0.21) and E. histolytica (p=0.92).

The present study didn't show any statistically significant correlation between source of food consumed and how they cleaned themselves after defecation with result of stool analysis (p=0.26, p=0.23) respectively.

Discussion

Street children constitute a marginalized group and have poor access to education or health services. The present study revealed that most of the children were between 11-15 years which is quite consistent with other studies[14,15]. This is understandable as children in this age group assume more independence in their lives as this is a crucial period of life for personality development.. We think that children under the age of 5 years are rarely found on the street without the supervision of a family member.

In a survey of 872 street children in Khartoum State in 2000 by Kudrati et al, approximately half of the children were 14 years old or younger; of those surveyed, 83% of boys and 80% of girls reported that their families originally did not live in Khartoum[16].

Most of the children in our study were boys, 187 (90.3%). Almost all reports indicate a clear male preponderance in street children: 75–90% of Latin American and African street children are males[17,18]. Boys are frequently expected to work to survive and be independent in early life. These gender differences in roles and family perception that the streets are more dangerous for girls help to explain the higher prevalence of boys living on the street.

The present study showed that the majority of the street children, 184(88.9%), were engaged in unskilled activities such as begging and street vending, and this is similar to other reports[19, 20]. This is due to illiteracy and lack of support from family members. The majority of the participating street children, 149(72%) did not attend school and about 27% of them stopped schooling at primary levels. Other studies showed similar findings[8,21]. Reasons for leaving school could be explained by: poverty, need to work, lack of interest and migration.

Street children have limited access to health care, the reasons for this include :cost, minority status, stigmatization by providers and distrust of quality of care. The majority of children in our study had positive stool result which is comparable to the findings of previous studies[22,24]. with the possibility that food, water or both may be the source of infection and this highlights the public health implications for this population all over the world. Parasitic intestinal infections can cause symptoms that include : anorexia, diarrhoea, and abdominal pains, and ,if left untreated, can lead to malnutrition, cognitive impairment, and a failure to thrive[25].

The commonest parasite detected in our study was Giardia lamblia in 36.7% followed by Entamoeba histolytica. In our study only one stool sample was obtained per child, and therefore, the prevalence of Giardia lamblia reported may be an underestimate since the parasite is intermittently shed in stool[26].

In contrast to our study, other studies have shown different pattern of intestinal parasitic infections with Ascaris lumbricoides, hook worms and Trichuris trichuria accounting for the major share[27,28]. This high prevalence of Ascaris lumbricoides in other studies is a good indicator of improper faecal disposal while the high prevalence of Giardia lamblia in our study reflects the use of contaminated water and food.

Conclusions

Homelessness, inadequate housing, and the associated health problems remain a key public health problem. The study revealed high prevalence of intestinal parasitic infections and associated risk indicators which in turn could be a potential source of the contamination of soil, water and street-vended food in street children in Khartoum State. Epidemiological information on the prevalence of various intestinal parasites among street children is very important for the development of appropriate control strategies because if left untreated , can lead to cognitive impairment and failure to thrive.

Acknowledgements

The authors express their sincere appreciation to the Ministry of Social Welfare and Planning in Khartoum State for giving their assistance in conducting this research. In additiona, the authors are grateful to the children who participated willingly in this study.

References

1. Sydor A: Conducting research into hidden or hard-to-reach populations. *Nurse Res* 2013, 20:3,33–37.
2. UNICEF. The state of the world's children 2012: Excluded and invisible:United Nations Publications Report No.: 9280639161; 2012. Accessed Dec. 2016
3. UNICEF. Excluded and invisible: state of the world's children,2006 , available at www. unicef.org/sowc06/pdfs/sowc06_fullreport.pdf .Accessed Jan.2016
4. World Health Organization (WHO), who are street children? 2006:1-4 available at www. street_children.org\ world\who3.htm. Accessed Jan. 2016
5. Woan J, Lin J, Auerswald C, The health status of street children and youth in low- and middle-income countries: a systematic review of the literature. *J Adolesc Health*. 2013 ;53: 314-321.
6. Aneci Rosa CS, Borba ES, Ebrahim GJ. The street children of Recife: a study of their background. *J Trop Pediatr1*992; 38:34–40.
7. D'Abreu RC, Mullis AK, Cook LR. The resiliency of street children in Brazil. *Adolescence*1999; 34:745–51.
8. WHO Expert Committee (2002) Prevention and control of schistosomiasis and soil-transmitted helminthiasis. *World Health OrganTech Rep Ser* 912: i-vi, 1-57, back cover.
9. Greksa LP, Rie N, Islam AB, Maki U, Omori K. Growth and health status of street children in Dhaka, Bangladesh. *Am J Hum Biol* 2007; 19:51e60.
10. Cumber SN, Tsoka-Gwegweni JM, The Health Profile of Street Children in Africa: A Literature Review. *J Public Health Afr.* 2015 ; 6:566.
11. Abdelgalil , R G Gurgel, S Theobald, L E Cuevas . Household and family characteristics of street children in Aracaju, *Brazil. Arch Dis Child* 2004; 89: 817–20.
12. Müller O1, Krawinkel M. Malnutrition and health in developing countries. *CMAJ*. 2005; 173:279-86
13. UNICEF (Sudan) Report (1990), Children in Difficult Circumstance, Situation Report on Street-Children, Khartoum. www. trocaire.org/ resources/tdr-article/towards-conceptualisation-street-children-case-sudan-and-ireland. Accessed Jan. 2016
14. Thapa K, Ghatane S, Rimal SP, Health problems among the street children of Dharan municipality, *Kathmandu University Medical Journal* 2009; 7: 272-279
15. Shanahan P. "Streets versus Elites: Tensions, Trade-offs, Treaties- Street Children in Accra, Ghana." Children, Youth and Environments 2003;13(1)
16. Kudrati M, Plummer ML, Yousif ND, Children of the sug: a study of the daily lives of street children in Khartoum, Sudan, with intervention recommendations. *Child Abuse Negl*. 2008;32:439-48.
17. Raffaelli M , Koller SH, Reppold CT, Kuschick M ,Krum F. Gender differences in Brazilian street youth's family circumstances and experiences on the street. *Child Abuse Negl* 2000; 24:143141.
18. Aptekar L , Ciano-Federoff LM. Street children in Nairobi: gender differences in mental health. *New Dir Child Adolesc Dev1*999:35–46.
19. Salem E.M., Abd el-Latif F: Sociodemographic characteristics of street children in Alexandria. *East Mediterr Health J.* 2002;8:64-73

20. Abdul hai M, Problems Faced By The Street Children: A Study On Some Selected Places In Dhaka City, Bangladesh, *International journal of scientific & technology research* 2014;10

21. Agnihotri P. Street boys of Delhi: A study of their family and demographic characteristics. *Indian J Med Sci* 2001; 55:543e8.

22. Bailey C, Lopez S, Camero A, Taiquiri C, Arhuay Y, Moore D, Factors associated with parasitic infection amongst street children in orphanages acrossLima, Peru. *Pathogens and Global Health* 2013: doi/10.1179/204777321 3Y.0000000073

23. Saksirisampant W, Nuchprayoon S, Wiwanitkit V, Yenthakam S, Ampavasiri A. Intestinal parasitic infestations among children in an orphanage in Pathum Thani province. *J Med Assoc Thai.* 2003; 86(Suppl 2):S263–70.

24. Guignard S, Arienti H, Freyre L, Lujan H, Rubinstein H. Prevalence of enteroparasites in a residence for children in the Cordoba Province, *Argentina. Eur J Epidemiol* 2000; 16:287e93.

25. Berkman DS, Lescano AG, Gilman RH, Lopez SL, Black MM. Effects of stunting, diarrhoeal disease, and parasitic infection during infancy on cognition in late childhood: a follow-up study. *Lancet.* 2002;359:564–71.

26. Danciger M, Lopez M. Number of Giardia in the feces of infected children. *Am J Trop Med Hyg.* 1975; 24:237–42.

27. Moges F Kebede Y, Kassu A, Degu G, Tiruneh M, Gedefaw M, Infection with HIV and intestinal parasites among street dwellers in Gondar city, North west Ethiopia, *Jpn.J.Infect. Dis* 2006; 400-403

28. Baldo E.,Belizari V, De leon W, Kong H, Chung D, Infection status of intestinal parasites in children living in residential institutions in Metro Manila,the Philippines. *The Korean Journal of Parasitology* 2004; 42:67-70

The effect of Gum Arabic on the level of plasma sodium, potassium and calcium in normal subjects

Hind Abdallah Modawi, *Rehab Mustafa Badi, Amal Mahmoud Saeed

Physiology Department, Faculty of Medicine, University of Khartoum.

Abstract

Background: Gum Arabic (GA) is a dried exudate obtained from the stems of Acacia senegal and closely related species of Acacia. Sudan is the world's largest producer. Gum Arabic research is exploring its beneficial effect on renal and cardiac diseases. Electrolyte levels in plasma are important in the management of patients with renal and cardiac diseases. Gum Arabic contains calcium, potassium and sodium so its intake may increase the level of these electrolytes in plasma which may constitute a hazard in these patients. This research was designed to investigate the effects of GA on plasma level of these electrolytes.

Objective: The aim of the study was to determine the effect of GA on the plasma levels of sodium potassium and calcium.

Materials & Methods: An intervention case control study was conducted in the Faculty of Medicine, University of Khartoum. Twenty nine subjects and 22 controls completed the study. All were normal females aged 16 -26 years. The intervention group consumed 30 grams of GA daily for eight weeks. The dose was divided equally into two: morning and evening. The levels of K^+, Na^+, and Ca^{++} were measured before and after the 8 weeks in both intervention subjects and controls. K^+ and Na^+ levels were measured using flame photometry and Ca^{++} level was measured by colorimetric method.

Results: No significant change occurred in the plasma levels of all the electrolytes tested.

Plasma K^+ level changed from 3.7 ± 0.42 to 3.6 ± 0.30 mmol/L (mean ± SD) in the intervention group and from 3.7 ± 0.40 to 3.7 ± 0.42 mmol/L in the control group (p= 0.36).

Plasma level of Na+ changed from 130 ± 7.2 to 130 ± 4.3 mmol/L (mean ± SD) in the intervention group and from 130 ± 5.6 to 130 ± 5.0 mmol/L in the control group (p= 0.9).

Plasma level of Ca++ changed from 9.1 ± 0.56 mg/dl to 9.9 ± 0.47 mg/dl within the intervention group ,while in the control group the level changed from 9.3 ± 0.45 mg/dl to 9.61 ± 0.45 mg/dl (p=0.053).

Conclusion: Consumption of GA for up to 8 weeks didn't adversely affect the level of electrolytes in normal subjects. However, its use in patients suffering from renal or cardiac diseases should be subjected to further studies.

***Corresponding Author:** Physiology Department, Faculty of Medicine, University of Khartoum.*

E-mail: rehabadi@gmail.com

Introduction:

Gum Arabic is edible, dried, gummy exudates from the stems and branches of Acacia senegal and Acacia seyal that is rich in non-viscous soluble fiber. It is defined by the FAO/WHO Joint Expert Committee for Food Additives (JECFA) as "a dried exudation obtained from the stems of Acacia senegal or closely related species of Acacia (family Leguminosae)" [(1)].

Sudan is the world's largest producer, followed by many other African countries. Gum Arabic readily

dissolves in water forming a solution characterized by low viscosity. This allows its use in various applications in food industry[2]. GA is indigestible to humans and animals, but its fermentation in the colon produces short-chain fatty acids (SCFA). These SCFA, specially butyrate, were found to have a wide range of health benefits[3]. The health beneficial effects of GA include: its prebiotic effect, reduction in plasma cholesterol level in animals and humans, anti-carcinogenic effect and anti-oxidant effect with a protective role against hepatic and cardiac toxicities. In addition to that, it has been claimed that GA slows the deterioration of patients with chronic renal failure. However, further studies are needed for confirmation[2].

Furthermore, it was found to have other effects such as: delaying gastric emptying, increasing fecal bulk and frequency of bowel movements by regulating colonic transit time. GA also slowed glucose absorption from the small intestine with reduction of postprandial blood glucose, serum total cholesterol and low density lipoproteins (LDL)[4].

GA was reported to decrease intestinal SGLT1 expression and activity and thus to counteract glucose-induced obesity[5].

Potassium is required for normal cellular functions. Relatively small changes in the concentration of extracellular K^+ greatly affect the extracellular: intracellular K^+ ratio and thereby affect neural transmission, muscle contraction, and vascular tone[6].

Sodium is the principal cation of the extracellular fluid and functions as the osmotic determinant regulating extracellular fluid volume and thus plasma volume. Sodium is also an important determinant of the membrane potential of cells and the active transport of molecules across cell membranes.

Calcium is found mainly in bones and teeth; only1% is found in the blood and soft tissue. The body will demineralize bone to maintain normal blood Ca^{++} level when calcium intake is inadequate. Thus, adequate dietary Ca^{++} is a critical factor in maintaining a healthy skeleton [7].

Gum Arabic contains Ca^{++}, K^+ and Na^+. In a previous study, when comparing a 10% solution of GA to tap water, the concentrations of Ca^{++}, K^+ and Na^+ were found to be 13.5± 1 mmol/L, 16.7± 1.2 mmol/L ,1.8± 0.6 mmol/L respectively in GA solution while they were 2.3± 0.1 mmol/L, 0.02± 0.003 mmol/L, 0.6± 001mmol/L in tap water[8]. This indicated a marked increase in the concentration of these electrolytes in GA solution.

Gum Arabic research is now investigating its beneficial effects on patients with cardiac and renal diseases in which electrolyte control is necessary. So, taking a solution with high concentration of these electrolytes may be hazardous in these patients. This study investigated the effect of GA intake on electrolyte concentration in plasma

Materials and Methods:

This study was conducted at the Physiology Department, Faculty of Medicine, University of Khartoum. The population selected was healthy female medical students in the University of Khartoum. Their age varied between16 to 26 years.

Subjects were volunteers who willingly signed their informed consent forms. The participants were divided randomly into intervention group and controls.

The intervention group received 30mg\day of gum Arabic for 8 weeks based on our finding in other published research[2] This was divided into 15mg at morning and 15mg at evening. Each dose was reconstituted in 400 ml of water. The control subjects did not receive GA. All participants were on their usual diet.

Fifty three intervention subjects and 27 controls have been included in the study, but only 29 intervention subjects and 22 controls have completed the study due to variable reasons but none was due to side effect of GA.

Blood samples were collected early morning after overnight fast. Plasma was separated and the concentration of Na^+ and K^+ were measured using the flame photometer, while Ca^{++} levels were determined using colorimetric method.

The data were analyzed using computed SPSS program, using one way ANOVA & paired T-test.

Results:

No significant change occurred in the levels of electrolytes tested.

K^+ level changed from 3.7 ± 0.42 to 3.6 ± 0.30 mmol/L(mean ± SD) in the intervention group and from 3.7 ± 0.40 to 3.7 ± 0.42 mmol/L in the control group(p= 0.36).

Na^+ level changed from 130 ± 7.2 to 130 ±4.3 mmol/L in the intervention group and from 130 ± 5.6 to 130 ± 5.0 mmol/L in the control group (p= 0.9).

Ca^{++} changed from 9.1 ± 0.56 to 9.9 ± 0.47 mg/dl in the intervention group. While in the control group the level changed from 9.3 ± 0.45 to 9.614 ± 0.45 mg/dl(p= 0.053).

Discussion:

It was reported that GA solution is rich in Na^+, k^+ and Ca^{++} [8] so its intake might increase the levels of these electrolytes in plasma and disturb their control. This is particularly important in patients with cardiac or renal disease. This study showed that there was no significant change in the plasma levels of Na^+, K^+ and Ca^{++} when GA was used daily for a period of 8 weeks by healthy subjects.

A study done on mice reported that, treatment with GA significantly increased plasma sodium but had no effect on plasma Ca^{++} and K+ .The intestinal and renal excretion of Ca^{++} , as well as the urinary excretion of Na^+ were both increased in that repor [8]

From this study, we could conclude that consumption of GA did not adversely affect the level of electrolytes in normal subjects, and could be used safely without fear of affecting electrolyte levels. The only reported side effects were: nausea, mild diarrhea and bloating of the abdomen in the first week of GA consumption. However, its effect on these electrolytes in critical patients suffering from renal or cardiac diseases should be studied.

References:

1. Ali BH, Al-Qarawi AA, Haroun EM, Mousa HM. The effect of treatment with gum Arabic on gentamicin nephrotoxicity in rats: a preliminary study. *Renal failure*. 2003;25:15-20.
2. Babiker R, Merghani TH, Elmusharaf K, Badi RM, Lang F, Saeed AM. Effects of Gum Arabic ingestion on body mass index and body fat percentage in healthy adult females: two-arm randomized, placebo controlled, double-blind trial. *Nutrition journal 2012*;11:111.
3. Phillips AO PG. Biofunctional behaviour and health benefits of a specific Gum Arabic. *Food Hydrocolloids* 2011; 25;165–9.
4. DODI LA-ES-G. The prebiotic effects of a new mixture of soluble fermentable fibres in the treatment of chronic constipation. *Pelviperineology* 2009;28 55-8.
5. Nasir O, Artunc F, Wang K, Rexhepaj R, Foller M, Ebrahim A, et al. Downregulation of mouse intestinal Na(+)-coupled glucose transporter SGLT1 by gum arabic (Acacia Senegal). *Cell Physiol Biochem2010;*25:203-210.
6. Food and Nutrition Board IoM. Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate. (National Academies Press) 2005:269-423.
7. Weaver CM HR. Calcium. Modern Nutrition in Health and Disease. 1999;9th ed:141-55.
8. Nasir O, Artunc F, Saeed A, Kambal MA, Kalbacher H, Sandulache D, et al. Effects of gum arabic (Acacia senegal) on water and electrolyte balance in healthy mice. *J Ren Nutr.* 2008;18:230-238.

Factors affecting compliance with psychotropic drugs for psychiatric patients: descriptive study

Rania Mustafa Alshiekh[1], Zakia Abdelrahman Ahmed[2], Hadayat A. Amasha[3]

[1]*Department of Psychiatric and Mental Health Nursing, Nile College, Sudan*

[2]*Department of Psychiatric and Mental Health Nursing, Faculty of Nursing Sciences, Khartoum University, Sudan*

[3]*Department of Maternity Nursing, Faculty of Nursing, Port Said University, Egypt.*

Abstract

Background: Poor compliance to psychotropic drugs regimens is a major obstacle to the effective care of persons who have chronic mental illness

Objective: The aim of this study was to identify the factors affecting compliance with psychotropic drugs for psychiatric patients.

Materials and Methods: A hospital-based, cross-sectional study design was carried-out in psychiatric outpatient department of Taha Basher Hospital, Khartoum State.

Sample: A total of 120 psychiatric patients were included and a purposive sampling technique was used. Data were collected by using face-to-face interview questionnaire.

Results: Seventy-one percent of studied patients were non-compliant with psychotropic drugs; compliance was significantly more in male patients (34.3%), single (35, 4%), and literate (33.3%). The major factors affecting compliance with psychotropic drugs and leading to non-compliance were: feeling better (45.0%), followed by high cost of drugs (25.0%), forgetfulness and fear from drugs side- effect (24.2% & 23.3%) respectively.

Conclusion: Non-compliance with psychotropic drugs was high in psychiatric patients. All efforts should be exerted to improve the compliance of psychiatric patients by eliminating the effects leading to non-compliance.

***Corresponding Author:** E. mail: zakiaahmed@uofk.edu*

Introduction:

Patient compliance refers to the willingness and ability of an individual to follow health-related advice properly, to take a drug as prescribed, to attend scheduled clinic appointments, as well as to complete recommended follow-ups[(1)].The use of drugs to treat psychiatric disorders is often the foundation for a successful treatment approach that can also include other types of interventions such as :psychotherapy or behavioral therapy [(2)]. Medication non-compliance is defined as a "discontinuation or failure of proper medication intake without prior approval from the treating physician" [(2)]. Factors that may affect patients' compliance with drugs can be summarized along five dimensions:

Patient characteristics (e.g., attitudes toward illness and medication, socio-economic considerations, social supervision);

Treatment setting (e.g., primary care versus specialty office and in-patient versus out-patient);

Medication characteristics (e.g. side effects, individual sensitivity to side effects, simple versus complicated medication regime);

Clinical features of the disorder (e.g., chronicity, exaggerated feelings of guilt in depression, suspiciousness in schizophrenia, substance abuse and co- morbid anxiety);

and clinician expertise (e.g., knowledge of pharmacology, empathy, instilling hope, successful integration of pharmacology and psychotherapy)[2].

Mental health nurses play a significant role in supporting drug compliance in people with mental illnesses particularly regarding psycho-pharmacological treatment and the education of the patient and their families. Also in assessment, drug administration, evaluation and counselling[3]. Therefore, improving drug compliance in patients who are mentally ill holds the potential for reducing morbidity and sufferings of patients and their families, in addition to decreasing the cost of re-hospitalization [4].

Significance of the study:

Poor drug compliance is significantly associated with an increased risk of hospitalization, re-admissions, emergency room visits, and symptom exacerbation. Irregular drug users increase hospital costs as compared to regular drug users. Irregular drug users had higher rates of hospitalization (42% versus 20%) and longer hospital stays (16 days versus 4 days). Mental health nurses play a significant role in supporting compliance to psychotropic drugs in psychiatric patients because psychiatric nurse spend more time in direct contact & work for the long-term management of psychiatric patients.

To the best of author's current knowledge, there is little or no published information on the magnitude of compliance of the psychotropic drugs in Khartoum State. The present study was undertaken to evaluate the magnitude of the problem of non-compliance and examine the factors contributing to non-compliance with psychotropic drugs among psychiatric patients.

Materials and Methods:

Study design: This is a descriptive, cross-sectional study conducted at Taha Baasher Psychiatric Hospital, Khartoum State in 2015.

Sampling: purposive sampling technique was used. One hundred and twenty psychiatric patients with prescribed psychotropic drugs, for more than one year, attending to psychiatry outpatient department.

Inclusion criteria: psychiatric patient's aged between 18 to 60 years of either sex were included in this study.

Exclusion criteria: psychiatric patients who were on psychotropic drugs for less than one year; having cognitive deficit; or acute psychosis; unable to undergo the interview and with no accompanying informant; age below 18 years and above 60 years were excluded from the study.

Data collection: structured interviewing questionnaire was developed after the review of the literature by the researchers which consists of three parts:

Part 1: consists of socio-demographic data.

Part 2: consists of medical history and history of disease (duration of illness, psychotropic drug regimen).

Part 3: consists of questions related to various factors affecting compliance (patient-centered factors, therapy-related factors, health care system factors, social & economic factors as well as disease factors).

Official ethical clearance was obtained from Taha Baasher Outpatient Clinic Director. Informed consent was obtained from the participants and their relatives. The researchers have made it clear that the participation in the study is not connected to, and does not affect, the care provided to the patient. The participants were told that they can withdraw at any time and their privacy will be protected. High confidentiality was ensured during filling of the questionnaires. Data were collected from the participants by face-to-face interview method. Each interview lasted about 15-20 minutes.

Data analysis: Collected data were analyzed using SPSS Version 20. Frequencies were calculated for socio-demographic data, patients characteristic and

factors affecting compliance to psychotropic drug. The proportion of compliance to psychotropic drugs also obtained: Presentation of analysis by percentages, figures and frequency tables.

Result:

Table1. Distribution of studied group according to factors affecting compliance to psychotropic drug related to socio-demographic characteristics (n=120)

Items	Total n=120	Compliance		P-value
		Yes No.35(29%)	No No.85(71%)	
Age				
Less than 28	27(22.5%)	10(37.1%)	17(62.9%)	
37-28	34(28.3%)	10(29.4%)	24(70.6%)	
47-38	35(29.2%)	8(22.8%)	27(77.2)	
48+	24(20.0%)	7(29.1)	17(70.9%)	
Gender				
Male	67(55.8%)	23(34.3%)	44(65.7%)	
Female	53(44.2%)	12(22.6%)	41(77.4%)	
Marital status				
Single	48(40.0%)	17(35.4%)	31(64.6%)	
Married	63(52.5%)	15(23.8%)	48(76.2)	
Divorced	6(5.0%)	2(33.3%)	4(66.7%)	
Widowed	3(2.5%)	1(33.3%)	2(66.7%)	
Occupation				
Employee	45(37,5%)	17(37.85)	28(62.2%)	
Student	10(8.3%)	4(40.0%)	6(60.0%)	
Unemployed	65(54.2%)	14(21.5%)	51(78.55)	
Level of education				
Illiteracy	28(23.3%)	5(17.9%)	23(82.1)	
Read & write	5(4.2%)	1(20.0%)	4(80.0%)	
Literate	87(72.5%)	29(33.3%)	58(66.7%)	
Residence				
Urban	74(61.7%)	22(29.7%)	52(71.3%)	
Rural	46(38.3%)	13(26.3%)	33(73.7%)	

Table1 shows the distributions of studied group by their socio-demographic data & their compliance to psychiatric drugs. It was found that there was no statistically significant difference between compliance and non-compliance of psychiatric patients as regarding socio-demographic characteristics.

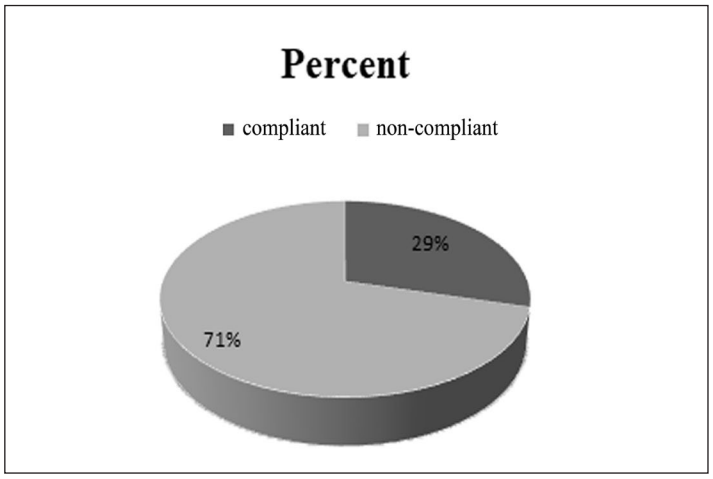


Figure 1. Distribution of the study group according to proportion of compliance to psychotropic drugs.

It was noticed that the majority of patients (71%) were not compliant to the psychiatric drugs as advised.

Table 2. Distribution of factors affecting compliance of psychiatric patients to psychotropic drug (n=120)

Factors		Yes		No
		Usually No. (%)	Sometimes No. (%)	
1	Forgetfulness	4(3.3%)	29(24.2%)	87(72.5%)
2	Feel better	54(45.0%)	6(5.0%)	60(50.0%)
3	Using traditional medicine or Religions belief	8(6.7%)	7(5.8%)	105(87.5%)
4	Longer duration of therapy	18(15.0%)	5(4.2%)	97(80.8%)
5	Embarrassed	3(2.5%)	-	117(97.5%)
6	Wants to be re-hospitalized	-	1(0.8%)	119(99.2%)
7	Suspiciousness	3(2.5%)	2(1.7%)	115(95.8%)
8	Denial of their illness	15(12.5%)	4(3.3%)	101(84.2%)
9	Feel worse	13(10.8%)	4(3.3%)	103(85.8%)
10	Believe that they are ineffective	10(8.3%)	1(0.8%)	109(90.8%)
11	Try to avoid addiction	18(15.0%)	3(2.5%)	99(82.5%)
12	Fear of causing side-effects	28(23.3%)	9(7.5%)	83(69.2%)
13	Not understanding instructions	-	1(0.8%)	119(99.2%)
14	Multiple drug therapy	11(9.2%)	2(1.7%)	107(89.2%)
15	Frequency of administration	8(6.70%)	2(1.70%)	110(91.70%)
16	Cost	30(25.00%)	13(10.80%)	77(64.20%)
17	Difficulty getting drug	25(20.8%)	12(10.0%)	83(69.2%)
18	Abuse of medical team	1(0.8%)	1(0.8%)	118(98.3%)

Table2 shows the distributions of factors affecting compliance of psychiatric patients to psychotropic drug. It showed that all factors mentioned have contributed to non-compliant with varying degrees.

Discussion

Non-compliance to medication is common among psychiatric patients, which is considered a major problem. Non- compliance rates among mentally ill seen range from 20% to 80% with an average rate of approximately 50% [5,6]. In this study, there was no association between socio-demographic characteristics and factors affecting compliance to psychotropic drug, the reality might be the diseases naturally the subject of concern. This correlates well with Lama study[7]. Also no significant association between factors affecting compliance to psychotropic drugs and the clinical details of patients (diagnosis, duration of illness & family history of mental illness, type of psychotropic drug, received instruction about drugs regimen and side effect). Possible reasons for these findings may be due to the fact that the people having major illness may require long-term treatment, which is again similar to Lama study[7].

This study showed that non-compliance was more common in the age group 38-47 years (77.2%) and is similar to other studies[8-10]. .It was also more common among females (77.4%) and in married females (52.5%) whch is consistent with Selen study findings[11]. In contrast, Zito study showed non-compliance was predominantly in unmarried patients[12]. Frazier study showed the opposite in married females. This could be explained by the help and support from a spouse ;and this could be the reason why married patients were more compliant to drug than unmarried patients[13,14]. Non- compliance is more common in unemployed patients (78.55) ,which is consistent with that of Bloom and other finding[15-17]. It is more common in illiterate patients (82.1%), which is similar to that of Maan[18].

Again, it is more common in patients with bipolar disorder (78.3%), which is in sharp contrast to that of Maan[18] and Victoria studies[19] who reported that schizophrenic patients have the highest non-compliance rate. The reason may be that bipolar patients do not have consistency during periods of treatment.

As regards to the factors affecting compliance to psychotropic drug related to patients , drugs and health care service the major factors for non-compliance were: feeling better (45.0%), difficulty getting drug (25.0%), forgetfulness (24.2%), fear of causing side effect (23.3%), longer duration of therapy (15.0%), try to avoid addiction (15.0%), denial of their illness (12.5%), feeling worse (10.8%), which are opposite to Bharat Pareek, Raman Kalia study, who found that there are other various factors perceived as contributing to non-compliance[20]. Because different cultures, settings and regions may lead to different factors.

Conclusion:

In the light of the present study findings, it can be concluded that, non-compliance is common in psychiatric patients. Factors found to be significantly associated with non-compliance were: female gender; illiteracy; unemployment; taking three types of psychotropic drugs. The main factors mentioned by participants affecting their compliance to psychotropic drug are: feeling better; cost of drug; and transportation problems. Forgetfulness, fear of drugs side-effect, longer duration of therapy; trying to avoid addiction; and denial of their illness are widely reported factors that cause non-compliance.

Recommendations:

Mental health nurse-patient relationship, as well as, psychiatric patient's knowledge of psychotropic drugs should be improved through proper training programs. Understanding the reasons for non-compliance by the health team and encouraging a collaborative approach can go a long way to improve compliance. Also, further research is needed to assess the impact of counseling on reducing the rate of non-compliance to psychotropic drug among psychiatric patients.

Acknowlegement:

This paper is based on an MSc Thesis submitted by Dr. Rania Mustafa Alshiekh and supervised by Dr. Zakia Ahmed

References:

1- Murphy J, Coster G. Issues in patient compliance, *Drug*, 1997, 54,797- 800.

2- Ghaziuddin N.King CA,Hovey JD,Zaccagni J, Ghaziuddin M.Medication noncompliance in adolescents with psychiatric disorders, *Child Psychiatry. Hum. Dev*.1999., 30, 103-110.

3- Keith GB,Koshy NK. Returning for follow up; attendance compliance in an Indian psychiatry. *Int Jr Soc psy*;37:173-81.

4- Nageotte C, Sulliman G, Duans N, & Camp P.L. Medication compliance among the seriously mentally ill in a public health system. *Social Psychiatry and Psychiatric epidemiology*,1997,32,49-56.

5- Mueser K T and McGurk SR. Schizophrenia. *The Lancet*. 2004; 363: 2067 – 68.

6- Magure S, Laudet AB, Mahmood D and Knight E. Adherence to Medication Regimens &Participation in Dual – Focus Self – Help groups. *Psychiatric Services*. 2002; 53: 310 – 13.

7- Lama S , Lakshmi KV, Shyangwa PM, Parajuli P. Level of compliance and factors associated with non-compliance to treatment among the mentally ill patients. *Compliance to treatment in mentally ill patients* 2012; 10:113-117

8- Leggat JE, Jr, Orzol SM, Hulbert-shearon TE, et al. Noncompliance in hemodialysis: predictors and survival analysis .*Am J Kidney Dis*.1998; 32:139-465

9- Loong TW. Primary non-compliance in a Singapore polyclinic. *Singapore Med J*.1999; 40:691-3

10- Hou R, Cleak V, Peveler R. Do treatment and illness beliefs influence adherence to medication in patients with bipolar affective disorder? A preliminary cross-sectional study. *Eur. Psychiatry* 2009; 25: 216-219.

11- Selen Yegenoglu, Albert L.Wertheimer, William R. Dublin. Demographical factors affecting patient compliance to medications in an outpatient psychiatric clinic: A preliminary study. FABAD *J. Pharm. Sci*. 2003; 28:77-84.

12- Zito, J.M., Routt, W.W., Mitchell, J.E., and Roering, J.L. Clinical characteristics of hospitalised psychotic patients who refuse antipsychotic drug therapy. *Am J Psychiatry*, 1985; 142:822-826.

13- Frazier PA, Davis-Ali SH, Dahl KE. Correlates of non-compliance among renal transplant recipients. *Clin Transplant*.1994; 8:550-7

14- Cooper C, Carpenter I, Katona C, et al. The AdHOC study of older adults' adherence to medication in 11 countries. *Am J Geriatr Psychiatry*.2005; 13:1067-76.

15- Sanele M, Thandinceba M, Siyabonga N et al. Medication adherence of psychiatric patients in an outpatient setting. *African Journal of Pharmacy and Pharmacology* 2012; 6:608-612.

16- Marco Di Bonaventura, Susan Gabriel, Leon Dupclay, Shaloo Gupta and Edward Kim. A patient perspective of the impact of medication side effects on adherence: results of a cross-sectional nationwide survey of patients with schizophrenia.*BMC Psychiatry* 2012; 12:20.

17- Bloom, J.D., Faulkner, L.R., Holm, V.M., and Rawlinson, R.A. An imperial view of patients exercising their right to refuse treatment. *Int J Law Psychiatry*1984; 7:315-328

18- Maan C G 1, Munnawar Hussain M S 2, Heramani N 3, Lenin RK 4. Factors Affecting Non-Compliance among Psychiatric Patients in the Regional Institute of Medical Sciences, Imphal. *IOSR Journal of Pharmacy*. 2015; 5: 01-07

19- Victoria Omranifard, Mohsen Yazdani, Mohammad Yaghoubi, Mahshid Namdari. Noncompliance and its causes resulting in psychiatric readmissions. *Iran J Psychiatry* 2008; 3:37-42

20- Bharat Pareek, Raman Kalia. Factors affecting noncompliance to psychotropic drugs of patients with psychosis as perceived by their family members attending the psychiatric outpatient department at selected hospital ,*Mangalore Journal*, 2013;9:56-62

Health Education

The use of a documentary drama film to improve the knowledge, attitude and practice of an endemic village population towards mycetoma at Sennar State, Sudan

*Ahmed H M Ibrahim[1], Ali M Osman[2], Ahmed H Fahal[3], Alnada A M Ibrahim[4]

[1]*Educational Development Centre, Faculty of Medicine, University of Khartoum*

[2]*Faculty of Fine & Applied Art, Sudan University of Science & Technology*

[3]*Mycetoma Research Centre, University of Khartoum, Khartoum, Sudan*

[4]*Faculty of Pharmacy, University of Khartoum*

Abstract

Background: Mycetoma is a badly neglected tropical disease, characterised by enormous deformities, disfigurement and disabilities if untreated early. Frequently, the majority of the mycetoma patients present late with advanced disease, and the only available treatment for them will be amputation of the affected part.

Aim: This study aimed at producing a health promoting film to be used to improve the knowledge, attitude and practice (KAP) of a targeted population in one of the mycetoma endemic villages at Sennar State, Sudan.

Materials and Methods : A 26 - minute drama film on a mycetoma patient journey from a small painless mass to advanced disease till lower limb amputation due to missinformation and negligence was performed. Professional actors and cinema work team were employed in the film production. It was filmed in one of the mycetoma endemic areas.

A cohort of 250 individuals from two mycetoma endemic villages were included in this study. A closed ended pre-designed questionnaire was used to collect data from the targeted population. The collected data included demographic characteristics, knowledge, attitudes and practices towards mycetoma. The data was collected before and after the film was shown.

Results: In this study, 218/250 responded to the questionnare with a response rate of 87%. Fifty-five percent of the respondents were males, 21.6% were farmers, 29.4% were students and 29.4% were unemployed.

The film had improved the KAP of the targeted population hence it can be used as a health educational material in other mycetoma endemic areas in the Sudan.

Corresponding Author: Educational Development Centre, Faculty of Medicine, University of Khartoum, E-Mail: ahmed.hussien@uofk.edu

Introduction:

Mycetoma is a badly neglected disease that attracts meager attention from health and social sectors across the world, especially in Sudan. However, its recent inclusion in the WHO/Neglected Tropical Diseases list came with the mandate to improve the patients' care and disease's advocacy hoping to eliminate the disease globally.[1,2] Mycetoma has many serious negative impacts on the health and well-being of patients, families, communities and health systems particularly in endemic regions.[3,4] It is endemic in many tropical and subtropical regions across the world. Sudan has the highest endemicity.[5-7] It starts as a small painless subcutaneous nodule and progresses slowly to affect the skin, deep

structures and bones,[8-10] leading to devastating deformities, disability and high morbidity[11-13]. The affected patients are usually children and young adults of low socio-economic status. It leads to serious economic and social consequences.[14,15]. Most patients present late with advanced disease and serious complications due to the painless nature of the disease, low socioeconomic status, low health education and lack of health facilities in endemic areas[16,17]. Early mycetoma is amenable to treatment but late disease is difficult to cure and has a bad prognosis[18-20].

There is no prevention or control program for mycetoma neither in Sudan nor globally. Equally, no strategy for expansion of the mycetoma services, nor the best modality for service provision is known[21,22]. High burden areas need to be identified to design appropriate evidence-based interventions to promote early detection of disease, proper patients' treatment and disease control and elimination.[10] The involvement of health workers in endemic areas in early case detection will improve the patients' diagnosis, treatment and disease prognosis.[11] The present study has been set out to produce a drama film to test and improve the knowledge, attitude and practice (KAP) towards mycetoma of targeted population in two mycetoma endemic villages, Sennar State. The available medical and health literature revealed that no similar study was reported from Sudan previously.

Materials and Methods:

This descriptive, cross-sectional, community-based study was carried out at Wad Onsa and Wad Elnimeir villages, Sennar State, Sudan. A twenty six minute drama film describing the journey of the protagonist character, Sewaikit, who had a small painless foot nodule which was neglected, This ultimatey developed advanced disease that eventually ended in lower limb amputation. The film shows the agony of both the patient and his family during the different disease stages, various local traditional treatments use, financial difficulties to acquire the proper treatment, and the socio-economic impact of the disease on the patient and his family. The film provided considerable information on the disease, its clinical presentation, investigation to confirm the diagnosis and treatment. It also shows the patient's positive progress, becoming a dedicated health advocate.

Professional actors and cinema work team had contributed to the film production. The film was produced in one of the endemic areas of the disease. The film was positively discussed by different groups of qualified arsists, designers and drama experts as well as some medical staff.The film followed the well-established process of documentary films production.[28]

The study included 250 individuals from two mycetoma endemic villages: Wad Onsa and Wad El Nimear at Sennar State, Sudan. These were randomly selected. Informed consent was obtained from every individual. (Figs.1,2)

A closed ended pre-designed questionnaire was used to collect data from the targeted population. The colleted data included: demographic characteristics, knowledge, attitudes and practices towards mycetoma. The data was collected before and after the film was shown. Assistance was provided to illiterate individuals.

Knowledge about the disease refers to the understanding of the concepts of mycetoma included risk groups, mode of transmission, symptoms, diagnosis, treatment, and prevention. This section consisted of 22 statements, and these were scored 1 or 0 for correct or incorrect answer respectively. Scores were summed for each respondent and levels of knowledge were categorized as Poor [0-10], Satisfactory [11-15], and Good [> 15].

Attitude refers to the degree of positive or negative agreement with statements concerning attitudes and beliefs towards interaction with mycetoma patients and appropriate treatment methods. The questionnare included four statements about attitude. The responses were scored 1 or 0 for positive or negative attitude respectively. The levels

of attitude scores were summed for each respondent and grouped into five categories as: totally negative [0], almost negative [1], moderate [2], almost positive [3], totally positive [4].

In this study practices refer to practices that reflect medical advice seeking, shoes wearing habits and other habits. The items were scored 1 or 0 for good or poor practice respectively. The levels of practice scores were summed for each respondent and grouped into two categories as: poor [0-3], good [4-5]

Ethical Considerations:

Ethical clearance was obtained from Soba University Hospital Ethical Committee.

The data was statistically analyzed using SPSS version 23, and statistical tests were used as appropriate

Results:

The questionnaire was distributed to 250 individuals in the selected villages, 218 responded with a response rate of 87%. There were 121 males (55.5%) and 97 females (45%). More than half of the respondents (55.2%) were in the age group 10-30 years, and 58.3% were non-educated or had only elementary education. Most of the respondents were workers (27%), housewives (29%) and pupils (27%) with a monthly income was less than SDG 1000 in 96.3%. (Table 1).

The sources of their knowledge about the disease were from the radio, television, press or contact with other people. (Fig. 3)

Most of the respondents thought that wearing shoes during work hinders their ability to carry out their work efficiently.

All of the respondents sought traditional herbal treatment first before ultimately (ranging from1-3 years) seeking medical advice. This was due mainly to difficulty of accessing medical service either from lack of it or its high cost as shown in Table 2.

Table 1. The demographic characteristics of the targeted population

Demographic characteristic	No. (%)
Age in years	
10-20	67(30.8%)
21-30	53(23.3%)
31-40	47(21.6%)
41-50	33(15.1%)
>50	18(8.3%)
Educational Level	
Basic	76(34.9%)
Intermediate	17(7.8%)
High Secondary	51(23.4%)
University	22(10.1%)
Postgraduate	1(0.5%)
Not-educated	51(23.4%)
Marital Status	
Married	110(50.5%)
Single	86(39.4%)
Divorced	10(4.6%)
Widow	12(5.5%)
Family Size	
Less than 5	78(35.8%)
6-8	78(35.8%)
>8	62(28.4%)
Occupation	
Farmers	47(21.6%)
Shepherds	12(5.5%)
Civil Servants	19(8.6%)
Free lancers	12(5.5%)
Pupils	64(29.4%)
Unemployed	64(29.4%)
Monthly Income in (SDG)	
Less than 500	107(49.1%)
500- 1000	104(47.2%)
1001- 1500	6(3.2%)
Have you had the Disease Before?	
Yes	22(10.1%)
No	196(89.9%)

Fig. 3: Disease knowledge among the study population

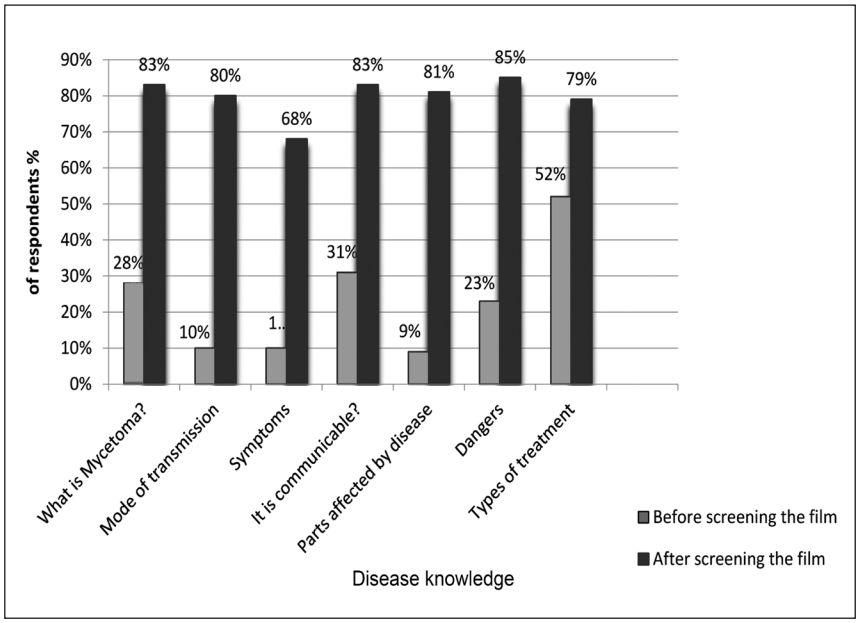


Table 2. Response to Attitude & Practice

Question	Pre-test	Post-test
Reasons for not wearing shoes		
Hinders work	79(36.2%)	73(33.5%)
Unavailability	56(20.7%)	58(26.6%)
Lack of Finance	83(38.1%)	87(39.9%)
Actions taken when disease appeared		
Seek traditional herbal medicines	9(4.1%)	1(o.5%)
Seek medical opinion	175(80.3%)	210(96.3%)
Buy medications without medical prescription	24(15.6%)	7(3.2%)
Reasons for not seeking medical service		
Unavailability	146(67.0%)	148(67.9%)
Medical consultation is expensive	46(21.1%)	31(14.2%)
Medications are expensive	25(1105%)	39(17.9%)
Others	1(0.5%)	0

Patients with current / or past history of mycetoma:

The study included 22 patients with active mycetoma or had a history of the disease. Most of them were males (86%), in the age group 21-30 years (45%), married (77%), farmers (45%), received the basic education (59%) and with monthly income between 500-1000SDG (95%).

Fifteen of these patients had traditional herbal remedies first; while only seven had medical treatment. Interestingly, even the latter group had native traditional at some stage.

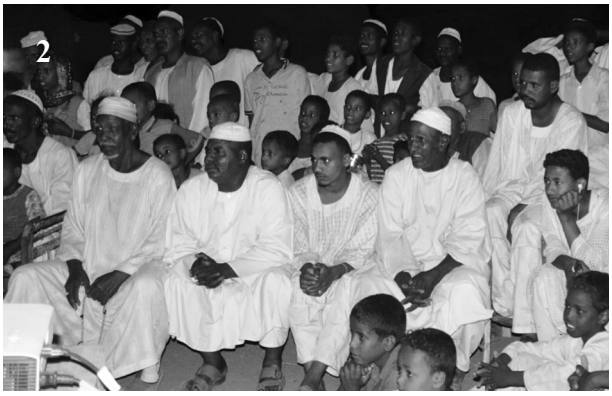
Nine of this group had no surgical intervention and were treated medically, whereas the rest underwent surgical procedures ranging from 1-7. Ultimately, seven of this group ended in amputation

The disease-free period for this group of patients ranged from 2-13 years.

Discussion:

This study shows that the study population is predominantly farmers. Most of the affected group was in the age group 20-40 years, which is the most productive phase of mankind.

The reluctance of participants in wearing protective shoes is due to unavailability and lack of finacial



Figs. 1, 2: The film screening at the studied villages

capacity. They view shoe wearing as an impediment to active and efficient work. This may have been a factor leading to the entry of the causative organism.

The study also showed that most of those affected had, at least, a rudimentary knowledge of its causes and how to combat it

One of the concerns highlighted by this study is the scarcity and lack of necessary medical services. The low socio-economic status of the participants and the high cost of treatment and transport were major factors in not seeking early medical advice and help. This calls for more resources to set-up well equipped primary health care facilities and dedicated health promotion programmes directed towards controlling and eliminating such a disease.

It is profoundly heartening that the health promotion material shown to the participants had a positive impact on their knowledge, attitude and practices towards the disease. They became more aware of the cause of the disease and how to combat it, seeking in the process early medical help and trying to procure protective shoes. The protagonist person himself (Sewaikit) became an ardent health advocate, who, while sitting in front of his small shop, telling the kids around him, his sad and painful story with the disease, which ultimately resulted in amputation of his leg.

The positive impact of multimedia production in shaping and promoting various health issues is reflected in similar studies from Pakistan, Iran, Jordan, Palestine and USA.[22-27]

To the best of our knowledge, this study is the first of its kind in Sudan. As it happened, it helped the villagers to listen carefully, reflect and make connections between the film and their struggle with the disease. The result obtainted reflects a strong positive impact in terms of the knowledge, attitude and practice

Limitations and challenges of the study:

The high cost of such undertaking. It was financed by the Mycetoma Research Centre (MRC) at Soba University Hospital.

Logistics of controlling and monitoring vast numbers of patients, actors, technicians (more than 150 personnel) provided constant challenges.

References:

1. Hay RJ, Fahal AH. Mycetoma: an old and still neglected tropical disease. Trans R Soc Trop Med Hyg. 2015; 109:169-70. doi:10.1093/trstmh/trv003.

2. Zijlstra EE, van de Sande WW, Welsh O, Mahgoub ES, Goodfellow M, Fahal AH. Mycetoma. Lancet Infect Dis. 16. 1, 100–112, January 2016. DOI: http://dx.doi.org/10.1016/S1473-3099(15)00359-X

3. Fahal AH, Hassan MA. Mycetoma. *Br J Surg*. 1992; 79: 1138-1141.

4. Fahal AH. Mycetoma thorn on the flesh Review article. *Trans R Soc Trop Med Hyg.* 2004; 98:3-11.

5. Fahal AH. Mycetoma. Review article, *Khartoum Med J.* 2011; 4: 514-523.

6. Nenoff P, van de Sande WW, Fahal AH, Reinel D, Schöfer H. Eumycetoma and actinomycetoma - an update on causative agents, epidemiology, pathogenesis, diagnostics and therapy. *J Eur Acad Dermatol Venereol.* 2015 Feb 27. doi: 10.1111/jdv.13008.

7. Fahal AH, EL Hassan AM, Mahgoub ES, Rahman ME, Mycetoma in the Sudan: The Mycetoma Research Centre Update. *PLoS Negl Trop Dis.* 2015 Mar 27; 9:e0003679. doi: 10.1371/journal.pntd.0003679. eCollection 2015 Mar.

8. Ezaldeen EA, Fahal AH, Osman A. Mycetoma herbal treatment: the mycetoma research centre, Sudan experience. *PLoS Negl Trop Dis.* 2013; 7: e2400

9. van de Sande WW. Global burden of human mycetoma: a systematic review and meta-analysis. *PLoS Negl Trop Dis.* 2013 Nov 7;7:e2550. doi: 10.1371/journal.pntd.0002550. eCollection 2013 Nov.

10. Fahal AH. Mycetoma in Williams, Bulstrode, O'Connell, Bailey and Love›s Short Practice of Surgery 26E: 26th Edition, Oxford University Press, 2013

11. Fahal A, Mahgoub ES, EL Hassan AM, Abdel-Rahman ME, Alshambaty Y, Ed E Zijlstra A New Model for Management of Mycetoma in the Sudan. *PLoS Negl Trop Dis.* 2014, 8: e3271. doi:10.1371/journal.pntd.0003271

12. Omer RF, Seif EL Din N, Abdel Rahim FA, Fahal AH. Hand Mycetoma: The Mycetoma Research Centre Experience and Literature Review. *PLoS Negl Trop Dis.* 2016;10: e0004886. doi:10.1371/journal.pntd.0004886

13. Eshraga A. Ezaldeen, Raif Mohamed Ahmed, EL Sammani Wadella, Nadia EL Dawi, Ahmed Hassan Fahal. Actinomycetoma induced Cervical Spinal Cord Compression: A rare and serious complication. *JMM Case Reports.* 2015; DOI 10.1099/jmmcr.0.000074.

14. Scolding PS, Abbas MAQ, Omer RF, Fahal AH. Madurella mycetomatis-Induced Massive Shoulder Joint Destruction: A Management Challenge. *PLoS Negl Trop Dis.* 2016; 10: e0004849. doi:10.1371/journal.pntd.0004849

15. Mohamed ElSW, Seif El Din N, Fahal AH. Multiple Mycetoma Lung Secondaries from Knee Eumycetoma: An Unusual Complication. *PLoS Negl Trop Dis.* 2016 Jul 21; 10:e0004735. doi: 10.1371/journal.pntd.0004735. eCollection 2016.

16. Fahal AH. Mycetoma in Richard, Guerrant, Walker, Peter, Tropical Infectious Diseases: Principles, Pathogens and Practice. Third edition, Elsevier Publisher, 2011, chapter 83, pp. 565-568

17. Hala Taha, Ahmed Fahal, Wendy WJ van de Sande. Mycetoma: Epidemiology, Treatment Challenges and Progress. Mycetoma: epidemiology, treatment challenges and progress. *Res Reports Trop Med.* 2015:6 31–36.

18. Fahal AH, Abu Sabaa. AH. Mycetoma in Children. *Trans R Soc Trop Med Hyg*. 2010; 104: 117–12.

19. Fahal AH, Rahman IA, El-Hassan AM, Rahman ME, Zijlstra EE. The safety and efficacy of itraconazole for the treatment of patients with eumycetoma due to Madurella mycetomatis. *Trans R Soc Trop Med Hyg.* 2011; 105: 127-32.

20. lsh O, Al-Abdely HM, Salinas-Carmona MC, Fahal AH (2014) Mycetoma Medical Therapy. *PLoS Negl Trop Dis.* 8: e3218. doi:10.1371/journal.pntd.0003218.

21. Suleiman SH, Wadaella el S, Fahal AH. The Surgical Treatment of Mycetoma. *PLoS Negl*

Trop Dis. 2016 Jun 23; 10:e0004690. doi: 10.1371/journal.pntd.0004690. eCollection 2016

22. Abu Zaida HY. Effectiveness of multimedia programmes in promoting knowledge and health awareness of 6th grade pupils. Unpublished MSc thesis.Islamic University, Gaza, 2006

23. Kishtar DDS, Khayyat DDS. Comparative Study of Multimedia and Conventional Education Methods in Undergraduate Training in Preclinical Endodontics. *J Res Med Sci* 2004; 4: 191-194.

24. Elfashtaki HA. Effectiveness of multimedia programme in health education about AIDS, *Uni Damascus J*. 2005;12: 313-378

25. H Silver, R Strong, M Perini, Integrating Learning Styles and Multiple Intelligences, Edu Lead. 1997; 55:22-28,

26. Altayyib A, Naseem K. Convergence of Technologies: The Print, Web and Multimedia United to Deliver an Integrated Basic Medical Sciences Course in a Resource Limited Setting, *J Coll Phys Surg Pakistan* 2013; 23: 607-609

27. Haylat S. Effect of dramatization of scientific material on 4th grade pupils studying social education, *Jordanian J Ed Sci*, 2006;2: 189-199

28. Giannetti L, Undersanding Movies 13th ed; 2013

Instructions to Authors

Authors are advised to read these instructions carefully. Adhering to the format of the journal guidelines will facilitate and limit the time needed for the processing of the paper.

Types of papers

Please specify the type of paper submitted for publication. The journal accepts the following categories: original articles, short communications, case reports, review articles, letter to the editor, medical news and quiz cases relevant to medical education.

Covering letters

1. Should specify the type of paper according to the first paragraph of this document.
2. If the authors wish, they can include in the covering letter information on related publications.
3. All authors should sign the covering letter.
4. Address all correspondence to:-

   The Editor, Khartoum Medical Journal, P.O.Box 102, Khartoum, Sudan.

   E.mail:kmj @meduofk.net

   E-mail:khartoummedicalj@gmail.com

Copyright

Submission of original articles for publication is an undertaking by the author/s that:-

1. The manuscript is not under consideration for publication elsewhere.
2. The manuscript is original, truthful and free of fabrication, fraud or plagiarism.
3. All authors have read the manuscript, agree to its contents and share in the responsibility of its publication.
4. All authors have made a substantial contribution to the work submitted e.g. conception and design, experimental work or clinical studies, analysis and interpretation of data, drafting and critical editing. Contributions such as obtaining material or other support does not justify authorship.
5. All funding and support for the work should be acknowledged.
6. Any part of the manuscript not owned by the authors requires that permission should be obtained by the authors from the owner of the copy right.
7. All papers published by the journal will be KMJ copyright.
8. Please also supply information or related papers in press or submitted for publication elsewhere.

The manuscript

1. Use of English Language according to Oxford English Dictionary style.
2. Formatting the manuscript: should be typed, double spaced, with margins not less than 3 cm.
3. The title should not be more than 100 characters and spaces.
4. The abstract should not be more than 250 words presented as follows: objectives or background – about 50 words, methods about 60 words, results about 60 words and conclusion about 60 words.
5. System of international units should be used. Equivalents may be given in parenthesis. Symbol and abbreviations: A Guide for Biological and Medical Editors and Authors, 5th Edition, 'London, Royal Society of Medicine Press 1999'.
6. Tables should be on separate pages.
7. Legends for tables and figures should be submitted separately.
8. Please supply two hard copies of manuscript, tables and figures as well as a digital copy which may be sent through the e-mail.

Illustrations

1. Illustrations should be kept to the minimum. Illustrations in color are acceptable; however, an extra charge may be required to be paid by authors.
2. Care should be taken that illustrative material may have to be reduced in size to fit pages or columns. It is recommended that the size of figures to be about 12.5x20 cm.
3. All illustrations should be numbered on the reverse side and the tope of the figure indicated.
4. Graphics should be clear, camera-ready and all

symbols explanations included on the figure or in the legend.

5. Permission to reproduce illustrations or tables should be obtained by the authors and submitted with the manuscript.

Statistical analysis

1. Statistical methods used should be clearly identified and if necessary described.
2. Means and standard errors of the mean and P values should be given to two decimal places.

References

1. Please use the Vancouver Style as shown below.
2. References should be listed numerically by order of their appearance in the text.

The Vancouver Style of Reference Formatting

With the growth of medical knowledge and research, it had become necessary that the formatting of reference citation both within the text of scientific writing and in reference lists should be widely agreed. The first steps to establish a uniform system for formatting manuscripts and references were begun by the Conference of Biological Editors in 1960. The International Committee of Medical Journal Editors (CMJE) held a meeting in Canada in 1979 to launch a uniform style of reference formatting for medical journals and proposed the Vancouver Style. Since then the major medical journals have adopted the 'Uniform requirements for manuscripts submitted to biomedical journals'[(1)], a common style for presentation of papers for publication.

- The justification of an internationally accepted style of reference citation can be summarized as follows:-
- Correct and complete referencing of scientific and medical publications is an essential component of the 'scientific method' when recording the outcome of research.
- To facilitate formatting scientific papers for more efficient peer reviews and publications.
- An unambiguous system of referencing allows other researchers and reviewers of manuscripts to access the cited literature to validate claims and arguments.
- To successfully secure research funding, the research proposal including the existing literature on which it is based should be convincing and easily accessed by reviewers.
- Uniform and complete citation formats facilitates quotation and reference compilation for researchers and postgraduate students.

The following is a summary to supplement the Instructions to Authors for referencing of manuscripts submitted to KMJ. It is based on the Vancouver Style and is the preferred referencing format for writing of dissertations, theses and other referenced writing in the Faculty of Medicine, University of Khartoum:-

1. References should be numbered consecutively throughout the text in the order in which they appear.
2. No references should be included in the abstract.
3. Identify references in the text, tables and legends by numerals in parenthesis e.g. (1), (2,3) or (3-6).
4. When citing authors in the text, acknowledge only the first author where there are three or more authors, e.g. Smith et al (1998) stated that ….(1).
5. Where there are two authors cite both, e.g. Adam and Ehsan (2003) reported that ….(2). Note that numerals in parenthesis at the end of a sentence are written before the full stop.
6. The list of references should begin on a new page and given the numbers which indicate order of citation.
7. All authors should appear in the list of references i.e. all references are listed in full.
8. Where more than 6 authors are registered, write the first 3 authors followed by et al.
9. The order of author/s initials, punctuation, title of article, year, journal title – in accepted abbreviated form, volume and page numbers, constitute a full reference citation. The following are examples of commonly used reference sources:

Reference in journals

General format including punctuation,

Author/s, title of article, title of journal (in italics with no full stops), year; volume number: page numbers.

e.g. Rose ME, Huerbin MB, Melick J, JK et al. Regulation of interstitial excitatory amino acid concentrations after cortical contusion injury. Brain Res 2002; 935: 40-6.

References in books

Author(s) of a book

General format including punctuation.

Author(s) Title: sub-title. Edition. Place of publication: Publisher; Year

e.g. Guyton AC, Hall JE. Textbook of Medical Physiology. 10th Ed. Philadelphia: Saunders; 1990.

Author(s) of a chapter in a book

General format including punctuation

Author(s) of the chapter. Title: sub-title of chapter. In: Author(s) (or editors) of the book. Title: sub-title of book. Place of publication: Publisher; Year; page numbers.

Elmunshid HA. Special senses. In: Sukkar MY, Elmunshid HA, Ardawi MS, editors. Concise Human Physiology 2nd Edn. Oxford: Blackwell Science; 2000.p.401-23.

Reference on-line

Example (from The Michener Institute for Applied Health Sciences, Learning Resource Centre: Irc@ michenere.ca).

Book on the Internet

Foley KM, Gelband H, editors. Improving palliative care for cancer [monograph on the Internet]. Washington: National Academy Press; 2001 [cited 2002 Jul 9]. Available from: http://www.nap.edu/books/o309074029/html/.

Internet homepage/website

Cancer-Pain.org [homepage on the Internet]. New York: Association of Cancer Online Resources, Inc.; c2000-01 [updated 2002 May 16; cited 2002 Jul 9]. Available from: http://www.cancer-pain.org.

For a fuller range of examples of citation from other sources of references, there are innumerable sites on the internet. Please also consult the publications cited in KMJ instructions to authors and the references cited below:-

1. Uniform requirements for manuscripts submitted to biomedical journals: writing and editing for biomedical publication [home-page on the Internet]. Philadelphia, PA: International Committee of Medical Journal Editors; [updated 2003 Nov; cited 2004 Oct 9]. Available from: http://www.icmje.org/.
2. Style manual for authors, editors and printers. 6th Ed. Milton, Qld: John Wiley & Sons; 2002.