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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.

Designed & set: Ahmed Hussien M

CONTENTS

MEDICAL EDUCATION

Perception of medical students and faculty on teaching of professionalism: challenges and suggestions for improvement

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ABSTRACT

Objectives The aim of this study is to reflect on students' and teaching staff's perception regarding teaching of professionalism and challenges to its application.

Methods This is a descriptive, cross sectional survey. The study included 210 final year medical students and 21 staff members at universities adopting teaching on professionalism and located at Khartoum State. A Five-point Likert Scale was used to assess medical students' and teaching staff's perception on general concepts and objectives covered by professionalism courses, teaching and assessment methods. Data was analyzed using Excel sheet and Statistical Package of Social Sciences (SPSS) version 23.

Results Students' perception towards usefulness of professionalism course in achieving general objectives and concepts range from a mean of 1.55 for acquiring knowledge about historical roots and definition of professionalism as the most achieved objective to 3.65 for introduction to the group dynamics as the least achieved one. Main challenges fronting the teaching and assessment of professionalism included that unprofessional behaviors are not well addressed and learning environment is not well controlled to promote professionalism in addition to shortage in trained teaching staff.

Conclusions and recommendations Overall perception of both students and staff about the medical ethics, good professional practice as well as communication skills is positive**.** A supportive and conductive environment for enhancing adoption of good professional practice skills should be created both at the academic institutions and the clinical training sites within the health system whenever possible.

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INTRODUCTION

Medical education has focused on the teaching, learning, and assessment of elements where competency is considered relatively stable and less context-dependent such as knowledge and technical skills. The teaching and assessment of a dynamic, context dependent construct, such as professionalism was found to be difficult.[1]

The curricula of medical schools in Sudan are diverse and are based on different educational philosophies and teaching strategies. To uphold high professional standards of the medical graduates, Sudan Medical Council (SMC) issued a policy document for accreditation of medical schools in Sudan. The standards were based on adaptation of the WFME (World Federation for Medical Education) and the national standards of the medical colleges issued by the Ministry of Higher Education and Scientific Research. The latest update of these standards included satisfying the requirement of teaching and training courses of professionalism as mandatory requirement. This is similarly addressed by Professor Janet Grant in 2011 report.[2] The aim of her study is to guide the appropriate development of medical school curricula in Sudan with the intention of addressing the issues

of social accountability and context-sensitive excellence. She stated that there is a need for more structured teaching in medical professionalism. In 2011 SMC published its generic guideline on how to teach and assess professionalism in Sudan medical schools.[3] The document includes the courses that address professional behavior, medical ethics, communication skills and other related issues. SMC initiative to include teaching of professionalism in medical schools had impacted positively and an increasing number of medical schools are adopting inclusion of the generic module after adaptation.[4] The aim of this study is to reflect on students' and teaching staff's perception regarding teaching of professionalism and challenges to its application.

METHODS

This is a descriptive, cross sectional study, conducted during the period from December 2016 to June 2017. In 2016 a survey addressing teaching of professionalism in undergraduate medical schools in Sudan was conducted by the authors. It reviewed the curricula of 39 (81.25%) medical school and concluded that fourteen (35.9%) medical schools teach professionalism as recommended by SMC guide (2011). Out of the 14 medical schools, four universities (35%) were selected using stratified simple random technique. The selected universities were three governmental medical schools and one private medical school. The sample frame (P) for final year medical students in these four universities was estimated at 950 students, confidence interval was set at 95% and none response rate was assumed as 10%. The sample size was estimated at 246 students. The number of teaching staff involved in teaching professionalism modules and courses in the four universities was estimated at 25.

The medical students and teaching staff were asked about the usefulness of courses on medical ethics, professional behavior and communication skills, teaching and assessment methods. Responses were expressed using Five-point Likert Scale (Strongly agree=1, agree=2, undecided=3, disagree=4 and strongly disagree=5). Using a designed structured questionnaire; teaching staff was asked about challenges facing the process of teaching professionalism in undergraduate medical schools in Sudan.

A designed structured questionnaires addressing objectives, methods for teaching and assessing professionalism as recommended by SMC, were distributed to 250 final year medical students in the specified universities using simple random methods, and then recollected with help and contribution of medical students; 210(84%) students responded. A total of 25 (total coverage) questionnaires were distributed to teaching staff - who was involved in teaching of courses of professionalism. The questionnaire was completed by personal contact and e mails and twenty one (85%) responded.

Parametric test was used to compare means between two independent samples using T-Test. Parametric test (one sample test) was used to compare means in one-sample. The significance of difference between two mean values were considered as significant if <0.05.

RESULTS

The study involved 210 final year medical students, the majority of them 190(90.5%) agreed that the course on medical ethics and professional behavior is useful in acquiring the knowledge about the essential elements of the medical profession, including moral and ethical principles, followed by 175(83.3) who agreed that the courses are useful in learning how to be committed to patients, profession, and society through ethical practice and professional behavior. Only 12.8% agreed that the course is useful in acquiring knowledge about legal responsibilities underlying the profession. Using One – Sample test it was found that there is a significant difference ($P <0.001$) between the students' perception regarding usefulness of professional behavior and medical ethics courses in achieving the expected objectives (Table 1).

One hundred ninety two (91.4%) students agreed that the course on communication skills is useful in acquiring the Knowledge on how to be

empathetic to the physical and moral suffering of patients followed by 176(83.8%) who agreed that the course is useful in maintaining appropriate relations with patients, colleagues and society. Only 43(20.4%) and 34(16.1%) agreed that the course is useful in understanding of the group dynamics and learning how to give effective feedback, and working effectively within an interdisciplinary team, respectively. Using One – Sample test it was found that there is significant difference (P <0.001) between the students' perceptions regarding usefulness of communication course in achieving the expected objectives (Table 2).

One hundred seventy seven (84.2%) of the students agreed that video sessions is most useful method for teaching professionalism followed by ethical dilemmas (n=172, 81.9%), role play (n=186, 88.6%), group discussions, scenario and vignette (n=176, 83.8%), observation of role models (n=166, 79.0%), interactive lectures (n=170, 80.9%), tutorials (n=152, 72.3%), seminars (n=148, 70.4%) and web-based teaching with self-assessment questions and forum (n=178, 84.7%). Only 102(48.5%) students agreed that didactic lectures are useful in teaching professionalism.

All teaching staff agreed that video sessions and role play are the most useful methods for teaching on professionalism. While 20(95.2%) agreed on group discussions, scenario and vignette, observation of role models, web-based teaching with self-assessment questions / forum and tutorials whereas18(85.7%) agreed didactic lectures and seminars are useful methods for teaching (Table 3).

One hundred seventy four (82.8%) students agreed that case scenario is the most useful method for assessing professionalism followed by OSCE (n=128, 60.9%), group assessment (n=156, 74.2%), Standard patients / simulation (n=161, 76.6%), MCQs / MEQ (n=141, 67.1%), Oral / Viva (n=161, 76.6%) and portfolio. Twenty (95.2%) of the teaching staff agreed that Standard patients / simulation is the most useful method for assessing professionalism, followed by 19(90.4%), 16(76.1%), 14(66.6%), 13(61.9%) and 13(61.9%) who agreed on group assessment, Portfolio, oral / viva (and case scenarios), OSCE and MCQs/EMQs as useful methods for assessment of professionalism, respectively (Table 4).

Using T-test it was found that there is no difference between teaching staff's and medical students' perception regarding usefulness of methods used for teaching professionalism (P =0.15). However, there is statistical significant difference between teaching staff's and medical students' perception regarding usefulness of methods used for assessing professionalism (P <0.001). All teaching staff mentioned that unprofessional behaviors are not well addressed by the faculty and the learning environment is not well controlled to promote professionalism as the main challenges to teaching professionalism in medical schools. In addition 20(95.2%) mentioned that the number of trained teaching staff is not enough. Fifteen (71.4%) stated that teaching staff is not always offering a good example of role modeling; 12(57.1%) indicated that time allocated in the curriculum is not enough and it is difficult to integrate professionalism courses within their current curriculum while only four (19.0%) indicated lack of enthusiasm by teaching staff and lack of resources for teaching as challenges to teaching professionalism.

Table 1. Medical students' perception on usefulness of course on medical ethics and professional behavior (n=210)

Main Objectives	Agree/ strongly agree	Undecided	Disagree/ Strongly disagree	Mean
	Number (%)	Number (%)	Number (%)	
Know the essential elements of the medical profession, including moral and ethical principles.	190(90.5)	6(2.9)	14(6.7)	1.71
Acquire knowledge about historical roots, definition, values, attributes, behaviors, and associated duties and responsibilities	149(70.9)	12(5.8)	9(4.3)	1.55
Learn how to be committed to patients, profession, and society through ethical practice and professional behavior	175(83.3)	13(6.2)	22(10.4)	1.92
Know how to appropriately respond to ethical issues encountered in practice.	162(77.1)	23(10.9)	25(11.9)	1.92
Be exposed to delivering the highest quality of care and learn how to maintain and develop clinical competence	153(72.9)	27(12.9)	30(14.2)	2.09
Acquire Legal responsibilities underlying the profession	27(12.9)	37(17.6)	146(69.5)	2.66

Table 2. Students' perception toward communication skills courses usefulness. (n=210)

Main Objectives	**Strongly Agree/ agree**	**Undecided**	**Disagree/ strongly disagree**	**mean**
	Number (%)	**Number (%)**	**Number (%)**	
Know how to be empathetic to the physical and moral suffering of patients.	192(91.4)	07(3.3)	10(4.7)	1.78
Maintain appropriate relations with patients, colleagues and society	176(83.8)	16(7.6)	18(8.6)	1.87
Develop practical skills in effective counseling of patients	161(76.6)	22(10.4)	27(12.8)	2.02
Work in a health team with colleagues and other members and with family members, etc.	141(67.1)	35(16.6)	33(15.7)	2.26
Deal with difficult topics and situations in clinical practice: communicating with children and young adults, taking sexual history.	134(63.8)	29(13.8)	47(22.3)	2.36

Know the advanced abilities in conducting student seminars and making appropriate presentations	139(66.1)	25(11.9)	47(22.3)	2.38
Acquire how to approach literature search and prepare and deliver a presentation making effective use of audiovisual aids and media	128(60.9)	26(12.3)	55(26.1)	2.56
Acquire the Trans-cultural communication.	73(34.7)	18(8.6)	120(57.1)	2.60
Learn how to give effective feedback, and working effectively within an interdisciplinary team	34(16.1)	28(13.3)	157(74.7)	3.30
Be introduced to the dynamics of group work	43(20.4)	21(10.0)	146(70.9)	3.65

Table 3. Perception of medical students' and teaching staff's on methods used for teaching of professionalism. (n=210)

Teaching methods	Students				Teaching Staff			
	Strongly Agree/ agree	Undecided	Disagree/ Strongly disagree	mean	Strongly Agree/ agree	Undecided	Disagree/ Strongly disagree	mean
	Number (%)	Number (%)	Number (%)		Number (%)	Number (%)	Number (%)	
Video sessions	177(84.2)	17(8.1)	16(7.6)	1.68	21(100.0)	0(0.0)	0(0.0)	1.09
Ethical dilemmas	172(81.9)	26(12.3)	12(5.7)	1.78	20(95.2)	1(8.3)	0(0.0)	1.14
Role play	186(88.6)	02(0.9)	12(5.7)	1.79	21(100.0)	0(0.0)	0(0.0)	1.05
Group discussions, scenario and vignette	176(83.8)	19(9.0)	15(7.1)	1.81	20(95.2)	1(8.3)	0(0.0)	1.38
Observation of role models	166(79.0)	25(2.3)	19(9.0)	1.88	20(95.2)	1(8.3)	0(0.0)	1.19
Interactive lectures	170(80.9)	10(4.7)	30(14.2)	2.02	19(90.4)	0(0.0)	2(9.5)	1.71
Tutorials	152(72.3)	21(10.0)	37(17.6)	2.17	20(95.2)	0(0.0)	0(0.0)	1.62

Seminars	148(70.4)	22(10.4)	40(19.0)	2.19	18(85.7)	1(8.3)	2(9.5)	2.19
Web-based teaching	178(84.7)	45(21.4)	32(15.2)	2.29	20(95.2)	0(0.0)	1(8.3)	1.48
Didactic lectures	102(48.5)	34(16.1)	74	2.88	18	1(8.3)	1(8.3)	2.0

Table 4. Perception of medical students' and teaching staff's on extent of usefulness methods used for assessing course outcomes. (n=210)

Assessment methods	Students				Teaching Staff			
	Strongly Agree/ Agree	Undecided	Disagree/ strongly disagree	mean	Strongly Agree/ Agree	Undecided	Disagree/ strongly disagree	mean
Case Scenario.	174(82.8)	11(5.2)	35(16.6)	1.85	14(66.6)	1(4.7)	6(28.5)	2.62
OSCE.	128(60.9)	34(16.1)	48(22.8)	2.41	13(61.9)	0(0.0)	4(19.0)	1.48
Group assessment (role play –discussion)	156(74.2)	31(14.7)	23(10.9)	1.99	19(90.4)	1(4.7)	1(4.7)	1.71
Standard patients/ simulation	161(76.6)	28(13.3)	21(10)	1.99	20(95.2)	1(4.7)	0(0.0)	1.28
MCQs/MEQ	141(67.1)	17(8.0)	52(24.7)	2.39	13(61.9)	1(4.7)	7(33.3)	2.76
Oral / Viva	161(76.6)	32(15.2)	47(22.3)	2.41	14(66.6)	3(14.2)	5(23.8)	2.43
Portfolio.	84(40.0)	77(36.6)	27(12.8)	2.73	16(76.1)	5(23.8)	0(0.0)	1.86

DISCUSSION

Professionalism has been recognized for centuries as fundamental to medical practice, yet it has remained one of the most difficult areas within both undergraduate and postgraduate training. Since assessment is a powerful stimulus for learning, teaching of professionalism issues and observation in daily practice should be accompanied by explicit teaching and assessment of course outcome.[5] All major organizational bodies, including the ACGME(The Accreditation Council for Graduate Medical Education organization in USA), and the GMC in the UK, have developed competency frameworks for undergraduate and graduate training, which emphasize the explicit teaching and assessing of professionalism. [6-7]

The majority of medical students and staff members in this study agreed that video sessions, discussion of the common ethical dilemmas, role play and group discussion are useful methods for teaching while didactic lecture is the least useful. This is in disagreement with the findings of Dalia A. et al who reported that most students at Kuwait University stated that the most helpful method is contact with positive role models, whereas it is in agreement with our students' responses that the lecture was the least helpful method. [8] Byszewski et al reported that 92.5% of the students at Ottawa University thought that the single most important effective component of learning professionalism was role modeling followed by case scenarios.[9]

The majority of teaching staff agreed on Standard patients / simulation, group assessment (role play – discussion) and portfolio as the most useful method for assessing professionalism. While the majority of medical students stated that case scenario followed by OSCE are useful methods. Wilkinson et al conducted a systematic review to develop a blueprint to assess professionalism and they concluded that professionalism can be assessed using a combination of direct observations through the mini-CEX and collated views through Multi-Score–Feedback (MSF) and patients' opinions as crucial elements because they capture many aspects in reliable, valid, and feasible ways. A portfolio is a useful means to support such a program of assessment.[10]

All teaching staff stated that unprofessional behaviors are not well addressed by the faculty as one of the main challenges that intervene with promotion of professionalism teaching. Hickson and his colleague at Vanderbilt University School of Medicine (VUSM) addressed unprofessional behaviors among medical students, and designed a model for addressing disruptive behavior. They concluded that there is no single strategy that fits every situation; however understanding common excuses, rationalizations, denials, and barriers to change prepares physicians to appropriately address the real issues. In long term follow up they found that addressing unprofessional behavior can yield improved staff satisfaction and retention, enhanced reputation, improved patient safety and risk-management experience, and more productive work environment .[11] Papadakis MA et al found that physicians disciplined by the California State Medical Board had significantly higher odds of having manifested unprofessional behavior during medical school than non-disciplined physicians.[12] Evidence suggests that unprofessional behaviors result in reduced employee morale and productivity, high employee turnover, reduced communication, team work and efficiency, higher costs and decreased learner satisfaction and depression.[13]

The majority of the teaching staff mentioned that learning environment is not well controlled to promote professionalism. Paice E and his colleague reported that personal and professional development of medical students is more likely to occur in a supportive learning environment. Hence, it is important that all medical educators to analyze their learning environments and then develop strategies to ensure that all teachers and students demonstrate the values, attitudes and behaviors that characterize modern medical professionalism.[14] Two-third of the teaching staff admitted that they do not always give a good example of role modeling as a barrier to effective teaching on professionalism. This is similarly addressed by Byszewski et al who conducted a survey on student perception of professionalism, the curriculum and learning environment at the University of Ottawa. Role modeling of professionalism in all settings (including hospitals, clinics and other clinical milieus) is identified by students as the key component of a positive learning environment. [9] Murakami et al conducted a study in Japan and described how negative role modeling adversely affects professional behaviors and the career choice of trainees.[15] Similar findings were reported in a narrative exploration of how conflict between the formal and informal curriculum influences student values and behaviors.[16] Comparable studies showed the same response and state the importance of role models in learning of professionalism.[16-20] Such response highlights the impact of the "hidden curriculum" on learning about professionalism through contact with teachers and patients.

Half of the teaching staff mentioned difficulty to integrate professionalism courses within the current curriculum as a leading obstacle to teaching on professionalism. The SMC guide to teaching and assessing on professionalism remains flexible enough to accommodate the diverse needs and perspectives of different schools.[3] Most of the medical schools have already started activities supporting teaching and training, whose objective is to develop the professionalism of its students.

One third of teaching staff indicated that lack of enthusiasm by teaching staff and faculty is among

the hindrances to promote professionalism. There is growing evidence that there are some general principles that are useful to follow in implementation of professionalism courses; among which is institutional support; as it is difficult to initiate a major teaching program without the support of the Dean's office, the Chairs of the major departments and all staff members.

CONCLUSION AND RECOMMENDATION

Overall perception of both students and staff about the medical ethics / good professional practice as well as communication skills is extremely positive. Medico-legal aspects of practice need to be addressed in more depth**.** Poor professional performance and non-ethical behavior need to be discussed in small groups and case scenarios**.** A Supportive and conductive environment for enhancing adoption of good professional practice skills should be created both at the academic institutions and the clinical training sites within the health system whenever possible. More advocacy and training activities on teaching and training on professionalism should be implemented to enhance capabilities of trainers targeting multidisciplinary teams including academics as well as professionals at teaching institutions in the health system.

Further research is needed to explore the views of practicing physicians, other healthcare providers, and patients about professional attributes and behavior that will contribute to a better understanding of medical professionalism and adapting it to the community cultural and social context of Sudan as well as studying the challenges of training on professionalism within a low resource health system

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Original article

Correlation of plasma uric acid with blood pressure and dyslipidaemia in young Sudanese adults in Khartoum, Sudan

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ABSTRACT

Background Uric acid (UA) is associated with a number of diseases like: obesity, metabolic syndrome, hypertension, renal diseases and heart diseases. Hyperuricaemia may occur prior to the development of metabolic syndrome and may be used as predictor of it.

Methods This is a cross-sectional study done on 150 subjects aged between 18-25 years. The weight, height and waist circumference (WC) were measured and Body Mass Index (BMI) was calculated. Skin fold thickness was measured from triceps region and body fat percent (BF %) was calculated. Blood pressure (BP) was measured and a fasting blood sample was taken to determine UA, total cholesterol, low density lipoprotein (LDL), high density lipoprotein (HDL) and triglycerides (TGs).

Results Subjects were divided into three groups: obese (BMI ≥30kg/m^2, n=50), overweight (BMI 25-29.99 kg/m^2, n=49) and normal weight (BMI 18.5-24.99 Kg/m^2, n=51) group. UA showed insignificant difference between the three BMI groups. The correlations of UA with BP, BMI and WC were insignificant in this group of young adults. However, a significant positive association was found between UA and total cholesterol ($P<0.01$). A highly significant difference was found in the mean of HDL ($P < 0.005$) and LDL ($P < 0.005$) between the three BMI groups. The highest mean of LDL was found in the obese group.

Conclusion The positive correlation of UA with the total cholesterol in obese subjects indicates that Hyperuricaemia may predispose to cardiovascular problems even in young obese adults. Therefore it is important to assess uric acid in young obese adults.

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BACKGROUND

Uric acid (UA) is the end product of an exogenous pool of purines and endogenous purine metabolism. [1] Recently, evidences have suggested that Hyperuricaemia may play a role in the development and pathogenesis of a number of metabolic, haemodynamic and systemic diseases other than gout e.g. obesity,[2,3] metabolic syndrome,[4] hypertension,[5] cardiovascular diseases (CVD),[6,7] endothelial dysfunction, and insulin resistance.[8]

The metabolic syndrome (Met S) is identified as a condition of increased risk for CVD and type 2 diabetes mellitus (T2DM) in both sexes.[9] Several definitions and clinical screening parameters for the Met S have been proposed by various organizations e.g. the World Health Organization (WHO), the International Diabetes Federation (IDF) and the National Cholesterol Education Program–Adult Treatment Panel III (NCEP–ATPIII).[10] The WHO put insulin resistance as the major criteria for diagnosis of Met S plus 2 additional risk factors including obesity, hypertension, high triglyceride (TG), reduced high-density lipoprotein cholesterol

(HDL), or micro-albuminuria. Patients with T2DM were not excluded from diagnosis.[11] The NCEP–ATPIII criteria did not require insulin resistance per se and no other single factor for diagnosis, but stated the presence of 3 of the following 5 factors as the basis for the diagnosis of Met S: abdominal obesity, elevated TG, reduced HDL, elevated BP, and elevated fasting glucose (impaired fasting glucose or T2DM).[12] The IDF also dropped the WHO requirement for insulin resistance but made abdominal obesity, with particular emphasis on waist measurement as a simple screening tool, necessary as 1 of the 5 factors required in the diagnosis of Met S.[13]

Hypertension, high waist circumference (WC) and Met S were reported as the major cardiovascular risk factors associated with Hyperuricaemia in black African population.[14] The association of UA with elements of Met S like hypertension has been studied extensively.[15-17] It was found that increase in UA is associated with higher BP in children[18] and adults.[17,19] Independent of traditional hypertension risk factors, the link between high UA and hypertension is more pronounced in younger individuals, in women and African Americans.[19] Lee et al reported that the association between Hyperuricaemia and essential hypertension was clearer in women and men under age of 60 years. They suggested that people under 60 years may obtain maximal benefit from the treatment of Hyperuricaemia to prevent and treat hypertension.[20]

One of the studies investigated the relation between UA and dyslipidaemia; they reported that normal levels of UA might be a good indicator of the level of TGs and very low density lipoprotein cholesterol (VLDL) in men in a wide range of age.[21] Serious cardiovascular complications have been linked with serum UA like stroke or ischemic heart disease.[22,23] and carotid atherosclerosis.[24,25] Therefore, early detection and treatment of hyperuricaemia may be preventive of hypertension and cardiovascular complications.

METHODS

This is an analytical cross-sectional study which included 150 young adult subjects: 67 male and 83 female, aged between 18-25 years from Medical Campus University of Khartoum. Participants were divided into three groups: normal weight group were 51 subjects (BMI 18.50-24.99 Kg/m^2), overweight group (BMI 25.00-29.99 kg/m^2) were 49 subjects and obese group (BMI $\geq$30.00kg/m^2) was composed of 50 subjects. Subjects with hypertension, diabetes, renal or cardiac diseases were excluded. Those who take medication that may affect plasma UA, smokers, alcoholics and females who have amenorrhea or pregnancy were also excluded from the study.

This study was approved by the Ethical Committee (EC) of Faculty of Medicine University of Khartoum. Students were recruited from the medical campus by advertisements in the lecture halls and social networking sites. After explaining the procedure, the participant signed an informed consent approved by the EC. A structured questionnaire was completed for each participant including personal information and medical history. Physical examination was done by the researcher to exclude any abnormality. Participants were asked to attend in the early morning to the laboratory at the physiology department in the Faculty of Medicine, University of Khartoum. Arterial BP was measured by the researcher for all participants using mercury sphygmomanometer (Mercurial Sphygmomanometer Desk Model, China). The mean BP was calculated using the following formula.[26]

Mean BP= Diastolic BP+1/3(systolic BP- Diastolic BP)

Fasting venous blood was taken and plasma UA, total cholesterol, LDL, HDL and TGs were measured. The following anthropometric measurements were also done:

Height (cm) and weight (Kg) were measured using a balance beam scale with a height rod (RGZ-120,

China). BMI (Kg/m2) was calculated as a ratio between the weight (Kg) and height squared meters.

Waist circumference (WC) in cm was measured by a flexible plastic measuring tape on the exposed abdomen at a level midway between the lowest rib and the iliac crest at the end of normal expiration and with the subject standing.

Triceps Skin fold thickness (mm) was measured using Harpenden caliper.[27] and was used to calculate the body fat percent (BF%) according to the following equation.[28]

$y_1 = 4.019 + 0.894\ x_1$

Where y_1 = BF% of the body weight; x_1 triceps skin fold (mm).

Data was saved and analyzed using Statistical Package for Social Sciences (SSPS) version 21. Descriptive statistics was done and displayed as means and standard deviation. Comparisons of the means of UA, lipid profile between the three groups (obese, overweight and normal weight subjects) was done using ANOVA test. The associations between BP, anthropometric measurements, lipid profile in the three groups were done using Spearman correlation test.

RESULTS

The age of the participants ranged between 17-25 years. The means of age, anthropometric measurements and mean BP in different BMI groups are shown in (Table 1). Obese group had the highest mean of WC (101.8 ± 10.6 cm), BF% (26.4 ± 4.9%) and mean BP (90.0 ± 6.3mmHg).

Table 1. Means of Age, BP and anthropometric measurements in different BMI groups

Variable	Normal weight n=51 Mean ± SD	Overweight n=49 Mean ± SD	Obese n= 50 Mean ± SD
Age (years)	18.9 ± 1.9	20.0 ± 2.0	19.5 ± 1.9
Weight (Kg)	59.7 ± 7.0	78.1 ± 9.6	95.1 ± 12.5
BMI (Kg/m^2)	21.5 ± 1.8	27.5 ± 1.5	33.0 ± 2.4
WC (Cm)	74.4 ± 6.2	87.4 ± ٧,٧	101.8 ± 10.6
BF %	17.7 ± 12.3	21.2 ± 5.3	26.4 ± 4.9
BF (Kg)	13.7 ± 3.9	19.8 ± 5.1	27.5 ± 5.5
Mean BP (mmHg)	82.0 ± 6.7	87.6 ± 7.8	90.0 ± 6.3

BP: Blood Pressure

BMI: Body Mass Index

WC: Waist Circumference

BF: Body Fat

Comparing lipid profile in the different BMI groups showed insignificant difference in the means of total cholesterol and TGs between the three BMI groups (Table 2). However, a highly significance difference was found in the mean of HDL ($P < 0.005$) and LDL ($P < 0.005$) between the normal weight, overweight and obese subjects. The highest mean of LDL was found in the obese group (Table 2).

Table 2. Comparison of lipid profile and uric acid between different BMI groups

Variables (mg/dl)	Normal Mean ± SD	Overweight Mean ± SD	Obese Mean ± SD	F	P Value
Cholesterol	156.6 ± 25.6	149.9 ±24.9	156.2 ± 27.4	1.0	0.3
TGs	77.3 ± 17.8	74.3 ± 21.3	81.1 ± 23.8	1.3	0.3
HDL	79.5 ± 16.2	33.0 ± 7.9	36.0 ± 8.3	258.0	0.005**
LDL	62.5 ± 18.9	77.2 ± 29	79.9 ± 34.6	5.6	0.000**
Uric Acid	3.8 ± .8	3.7 ± .8	3.6 ± .7	.276	.759

TGs: Triglycerides

HDL: High Density Lipoprotein

LDL: Low Density Lipoprotein

*P is significant at <0.05, **P is highly significant at ≤0.005

Comparison of the means of plasma UA showed no significance difference between the different BMI groups as shown in Table 2. However, plasma UA showed significant positive association with plasma cholesterol (P<0.01). The correlation between UA and BP was insignificant in the three BMI groups. In this group of young adults, the association of UA with BMI and WC was statistically insignificant.

DISCUSSION

The results of this study showed insignificant association between plasma UA and BP in this group of young adults. However, considerable number of studies found association between UA and BP.[17-19] Feig and Johnson showed a high correlation between serum UA and BP in children with primary hypertension.[29] UA has been claimed to have a role in the pathogenesis of hypertension in the young.[30] Animal models support a two-phase mechanism for the development of hyperuricaemic hypertension. Initially, UA induces vasoconstriction by activation of the renin-angiotensin system and by reducing the circulating nitric oxide,[31] which can be reversed by lowering UA. Over time, UA uptake into smooth muscle cells of the vessels causes cellular proliferation and secondary arteriolosclerosis that impairs pressure natriuresis, causing sodium-sensitive hypertension.[32]

The most widely recognized factors of Met S are atherogenic dyslipidaemia, elevated BP, and elevated plasma glucose. Subjects with these characteristics commonly manifest a prothrombotic state and a pro-inflammatory state.[10] Atherogenic dyslipidaemia consists of an aggregation of lipoprotein abnormalities that includes elevated serum TG and apolipoprotein BP, increased LDL and a reduced level of HDL.[10] Recently, the association between the plasma UA and dyslipidaemia has been suggested.[33,34] In our study we found a positive correlation between plasma UA and plasma cholesterol (TC) in young adult subjects. Comparable results were found by Sarmah et al who estimated the lipid profile (TC, TGs, HDL and LDL) in sixty hyperuricaemic Assamese people (Indian tribe) with no history of CVD. They reported a significant positive correlation between UA and TC.[35] Peng et al found that serum UA had a strong association with LDL, TGs, TC, Apo-B levels, ratio of TGs to HDL, and ratio of Apo-B to Apo-A1.[33] In vitro, UA induced an increase in the production of monocyte chemotactic protein-1, an adipokine that plays an essential role in inducing the pro-inflammatory state in human adipocytes.[36] Therefore, hyperuricaemia might be a mediator of pro-inflammatory endocrine imbalance in the

adipose tissue which can be considered as one of the mechanisms of insulin resistance in subjects with the Met S.[36] Zhu et al reported that Hyperuricaemia lead to inhibition of nitric oxide (NO) which lead to insulin resistance.[37] Furthermore, it has been reported that UA directly induces hepatocyte fat accumulation which may result in non-alcoholic fatty liver disease.[37,38]

CONCLUSION

The positive correlation of UA with cholesterol indicates that Hyperuricaemia may predispose to cardiovascular problems even in young age. Therefore it is important to assess UA in obese young adults. In addition, healthy life style and awareness about diets which increase UA and lipid profile are recommended to decrease the risk of cardiovascular diseases and metabolic syndrome.

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Addressing defaulting in tuberculosis management and the role of dispensing pharmacy personnel in Omdurman, Sudan

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ABSTRACT

Background Ending Tuberculosis epidemic by 2030 is a health target for the Sustainable Development Goals set by WHO. Multidrug-resistant-TB is a public concern, with treatment defaulting being an important factor. This study aims to assess the knowledge, attitude, and practice of dispensing pharmacy personnel regarding tuberculosis treatment and defaulting.

Methods A cross-sectional, mixed-methods study was conducted during October 2011 in 7 TB-treatment centers in Omdurman locality, Sudan among 23 pharmacy dispensing personnel. A questionnaire was used to collect the data.

Results National TB program Sudan was the main source of TB management knowledge for 21 (91.3%) of participants. All of them (n=23), correctly knew drug-regimen for new and re-treatment of TB-cases. However, 13 (>50%) displayed inadequate knowledge of medication safety while 21 (91.3%) of participants attributed drug-resistance to therapy interruption. The long-distance between TB-centres and patient home, treatment-related costs, initial recovery, and noncompliance were reported as reasons for defaulting. About 15 (65.2%) of participants believed medication adherence is patient responsibility. None of them believed drug-choice is pharmacist's role. The majority, 21 (91.3%), strongly agreed with TB-program in Sudan. All, 23, strongly agreed and agreed with TB single-pill and attaching the patient's laboratory results with the prescription, respectively. Interestingly, 16 (69.6%) of participants strongly disagreed with DOTS. Five (21.7%) participants stop TB-drug in case of side-effects before referral, and only 1 (4.3%) participant educated patients about TB and its medications.

Conclusion Dispensing pharmacy personnel displayed good knowledge of TB drug-regimen, defaulting causes and the overall TB-care; however, they showed inadequate knowledge of medication safety, deficient practice as compared to knowledge, and negative attitude towards DOTS.

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INTRODUCTION

Ending Tuberculosis (TB) epidemic by 2030 is one of the health targets of the Sustainable Development Goals (SDG) set by WHO.[1] In 2015, 10.4 million new cases of TB were reported globally as compared to 9 million cases in 2013[1,2] Although direct comparison of incidence rate might not be appropriate, as multiple factors could affect the rate of disease reporting. In Sudan, TB cases account for up to 15% of the TB burden in the Eastern Mediterranean Region.[3,4] Sudan was categorized as a high burden country of TB and Human Immunodeficiency Virus (HIV) before it was removed from the list in 2015.[3,4]

A recent dilemma in managing TB burden is the treatment of multidrug-resistant-TB (MDR-TB). About 300,000 patients with TB have MDR-TB. Of those, 136,000 patients were eligible for treatment, and only 97,000 of them received the treatment, with a success rate of 51 %.[1,2] Notably, patients with

MDR-TB constitute around 20.5% of previously treated TB cases.[1,2] Among others, MDR-TB could be attributed to the inappropriate drug choice, dose or duration, and defaulting from treatment, creating a resistant strain of *Mycobacterium tuberculosis*.[5] Re-treatment of TB occurs after relapse, failure of treatment, or defaulting. Previous studies found that male gender, younger patient age, unknown or positive HIV status, medication side effects, initial sense of recovery after TB therapy, being a re-treatment case, financial difficulties, lack of family support, heavy drinking, being imprisoned or arrested, miscommunication with health-care providers, lack of access to health-care services, and change in job or residency location were all risk factors for defaulting from TB treatment.[6,7,8] In contrast, female patients, and those on antiretroviral therapy (ART) were less likely to default from treatmen.[6]

All things considered, ending TB necessitates multidisciplinary actions at the team level.[9,10] Pharmacists are usually the first-encountered people in the healthcare system of low and middle-income countries.[11] Pharmacists are thus expected to play a crucial rule in TB detection, MDR-TB prevention, and the overall management of TB in those countries.[11] Nevertheless, there is a paucity of information regarding the current role of pharmacists in TB management and defaulting issue, especially in Sudan. Therefore, this study sought to assess the knowledge, attitude, and practice of dispensing pharmacy personnel about TB management and defaulting in one of Sudan localities.

METHODS

This was an observational, cross-sectional study. It was conducted in all of the functioning TB treatment centres (7 in total) in Omdurman locality in Sudan during October 2011. The targeted population included all dispensing pharmacy personnel working in these 7 centres (23 persons). Study variables were the knowledge, attitude, and practice in TB management and defaulting. A questionnaire consisting of 27 questions was designed, and its items were subjected to expert review. The knowledge and practice regarding TB medications and their side effects were assessed using a multiple-choice format. The attitude was evaluated with a 5-point Likert Scale. Other questions, 1 in knowledge, and 2 in practice sections, were qualitative for open responses.

Ethical approval was obtained from the Department of Family and Community Medicine Institutional Review Board (IRB) in the University of Khartoum, Sudan. All dispensing pharmacy personnel in the 7 centres were invited to voluntarily participate in the study, and informed verbal consent was taken. Data was collected through face-to-face interview, and participants' responses were filled in the study questionnaire. The data was analyzed manually. Frequency tables and figures are used to present the quantitative responses, and common answers were selected to represent the qualitative responses.

RESULTS

All of the 23 dispensing pharmacy personnel targeted in this study agreed to participate (response rate=100%). As illustrated in (Table 1), females constituted 15 (65.2%) of the study population. Nine (39.2%) of the 23 participants have from 1 to 4 years of practice experience, and the majority (n=14, 61%) of dispensing personnel are assistant pharmacists.

The knowledge of dispensing pharmacy personnel

The main source of most participants' (n=21, 91.3%) knowledge about TB management was the National TB program Sudan. All participants (n=23) answered correctly regarding the first-line drugs to be used in new and re-treatment TB cases (Table 2). Nevertheless, 13 (>50%) of them did not know the safety profile of TB medications (rifampicin, isoniazid, ethambutol, pyrazinamide, and streptomycin) in pregnancy, breastfeeding, use of contraceptive pills, children, hepatic or renal failure (Table 3). About 21 participants (91.3%) attributed drug resistance among other causes in TB management to therapy interruption by patients (Table 4). Furthermore, in the qualitative question concerning participants' knowledge about

defaulting causes, common answers were a long distance between TB centres and patient home, unaffordable treatment-related costs, patient sense of recovery after therapy initiation, and patient non-compliance (Table 4).

As shown in Table 5, on promoting patient adherence to TB medications, the majority of the dispensing personnel, 16 or more (>65%), reported that one or a combination of the following would be effective in increasing patient compliance: patient education about the disease and the importance of drug adherence, giving instructions about the proper timing to take the medications to avoid food-drug interactions, and patient follow-up during treatment course. Moreover, to directly assess for patient compliance, 15 of the participants (65.2%) would directly ask the patient about it, nonetheless, 15 (65.2%) of them believe that medication adherence is the patient responsibility.

The attitude of dispensing pharmacy personnel

About 18 participants (78.3%) believed that drug choice is the responsibility of the physician alone, and none of them reported it as the pharmacist role (Table 6). The majority of the dispensing personnel (n= 21, 91.3%), strongly agreed with the current TB treatment program in Sudan. Furthermore, all of them (100%) strongly agreed and agreed with converting TB medications into a single pill and attaching the patient's laboratory results with the prescription, respectively. On the other hand, 16 (69.6%) of the participants strongly disagreed with the DOTS strategy (Directly Observed Treatment Short-course) as shown in Figure.

The practice of dispensing pharmacy personnel

In managing the side effect of TB medications, only 5 participants (21.7%) said that they would stop the medication and then refer the patient to a physician. In contrast, the majority of them, 18 (78.3%), would directly refer the patient to a physician. Upon medication dispensing, all participants (100%) reported that they routinely advise TB patients not to stop their medications, and to use tissues to cover their cough, maintain good nutrition and keep their surrounding environment healthy and clean. Nevertheless, only 1 participant (4.3%) used this opportunity to educate the patients about TB and its medications as summarized in Table 7.

Table 1. Demographics of study participants (n= 23)

Variable	Frequency (%)
Gender	
Female	15 (65.2)
Male	8 (34.8)
Years of practice	
1-4	9 (39.2)
5-10	7 (30.4)
>10	7 (30.4)
Qualification	
Clinical pharmacist	1 (4.3)
Pharmacist	6 (26)
Assistant pharmacist	14 (61)
Medical assistant	2 (8.7)

Table 2. Participants' knowledge of TB treatment and source of their information

Variable	(%) Frequency
Knowledge on first-line drugs in new TB cases (CAT I & III)	
Correct regimen	23 (100)
Didn't know	0 (0)
Knowledge on first-line drugs in re-treatment TB cases (CAT II)	
Correct regimen	23 (100)
Didn't know	0 (0)
Information source about TB treatment	
National TB program Sudan	21 (91.3)
Informative presentations	0 (0)
Others	2 (8.7)

CAT I: New sputum smear-positive or smear-negative with excessive lung involvement; severe non-pulmonarydisease should receive INH_RIF+E+PZA[12]; CAT II: patients with sputum smear-positive after relapse, treatment failure, or interruption should receive INH_RIF+E+PZA+S according to 2010 WHO recommendation.[12]In 2017 update, CAT II is no longer used in patients requiringTB re-treatment and drug-susceptibility testing should be conducted to inform drug choice[13]; CAT III: New smear-negative and less severe non-pulmonary disease should receive INH_RIF+E+PZA[12]

Table 3. Participants' knowledge of TB medications' safety

Item-drug	Safe (%)	Unsafe (%)	Don't know (%)	Item-drug	Safe (%)	Unsafe (%)	Don't know (%)
Children				Hepatic failure			
Rifinah*	8 (34.8)	2 (8.7)	13 (56.6)	Rifinah*	2 (8.7)	7 (30.4)	14 (60.9)
Ethambutol	5 (21.7)	5 (21.7)	13 (56.6)	Ethambutol	5 (21.7)	4 (21.4)	14 (60.9)
Pyrazinamide	7 (30.4)	3 (13)	13 (56.6)	Pyrazinamide	6 (26.1)	3 (13)	14 (60.9)
Streptomycin	7 (30.4)	3 (13)	13 (56.6)	Streptomycin	5 (21.7)	4 (17.4)	14 (60.9)
Pregnancy				Renal failure			
Rifinah*	4 (17.4)	4 (17.4)	15 (65.2)	Rifinah*	5 (21.7)	3 (13)	15 (65.2)
Ethambutol	5 (21.7)	5 (21.7)	13 (56.6)	Ethambutol	5 (21.7)	4 (21.4)	14 (60.9)
Pyrazinamide	6 (26.1)	3 (13)	14 (60.9)	Pyrazinamide	5 (21.7)	2 (8.7)	16 (69.6)
Streptomycin	4 (17.4)	6 (26.1)	13 (56.6)	Streptomycin	3 (13)	6 (26.1)	14 (60.9)
Breas-feeding				Contraceptive pills			
Rifinah*	5 (21.7)	3 (13)	15 (65.2)	Rifinah*	3 (13)	4 (17.4)	16 (69.6)
Ethambutol	5 (21.7)	4 (21.4)	14 (60.9)	Ethambutol	3 (13)	4 (17.4)	16 (69.6)
Pyrazinamide	6 (26.1)	3 (13)	14 (60.9)	Pyrazinamide	6 (26.1)	2 (8.7)	16 (69.6)
Streptomycin	6 (26.1)	3 (13)	14 (60.9)	Streptomycin	6 (26.1)	2 (8.7)	15 (65.2)

Ideal answer is underlined, and it reflects the rate of correct responses. ***:** Rifinah: rifampicin and isoniazid

Table 4. Causes of resistance to TB medications and defaulting from TB treatment (according to study participating dispensing pharmacists)

Causes of resistance to TB medications	Frequency (%)
Inappropriate drug choice	9 (39.1)
Incorrect drug dose	9 (39.1)
Interruption of treatment by patients	21 (91.3)
Causes of defaulting from TB treatment	Frequency (%)
Patient lives faraway from TB center	23 (100)
Patient stops the medication when he/she feels better	23 (100)
Patient stops the medication due to financial difficulties	23 (100)
Patient non-compliance to treatment	23 (100)

Table 5. How to increase medication adherence and ensure compliance among TB patients (according to study participating dispensing pharmacists)

Discipline and items	Frequency (%)
1. Promoting patient adherence to medication	
TB education, importance of taking medications	18 (78.2)
Instruction on correct time for taking medications	17 (73.9)
Patient follow up during treatment course	16 (69.5)
2. Ensuring compliance	
Direct questions to patient about compliance	15 (65.2)
Asking patient to bring medication blister packet to TB center	7 (30.4)
Believe compliance is mainly patient responsibility	15 (65.2)

Table 6. Attitude towards whose responsibility is to choose the appropriate TB medication

Responsible party	Pharmacist	Physician	Patient	Physician & patient
Frequency (%)	0 (0)	18 (78.3)	0 (0)	5 (21.7)

Table 7. Practice of participant dispensing pharmacy personnel in TB care

Discipline and items	Frequency (%)
1. Approaching a patient with medication side effects	
Stop medication and refer to a doctor	5 (21.7)
Refer to a doctor	18 (78.3)
2. Advices/Instructions given to patients	
Education about TB	1 (4.3)

Education about medication-related information	1 (4.3)
Do not stop medications	23 (100)
Education on usual side effects of medications	1 (4.3)
Stop smoking and alcohol during treatment	1 (4.3)
Maintain good nutrition	23 (100)
Maintain healthy environment, use tissues to cover cough	23 (100)

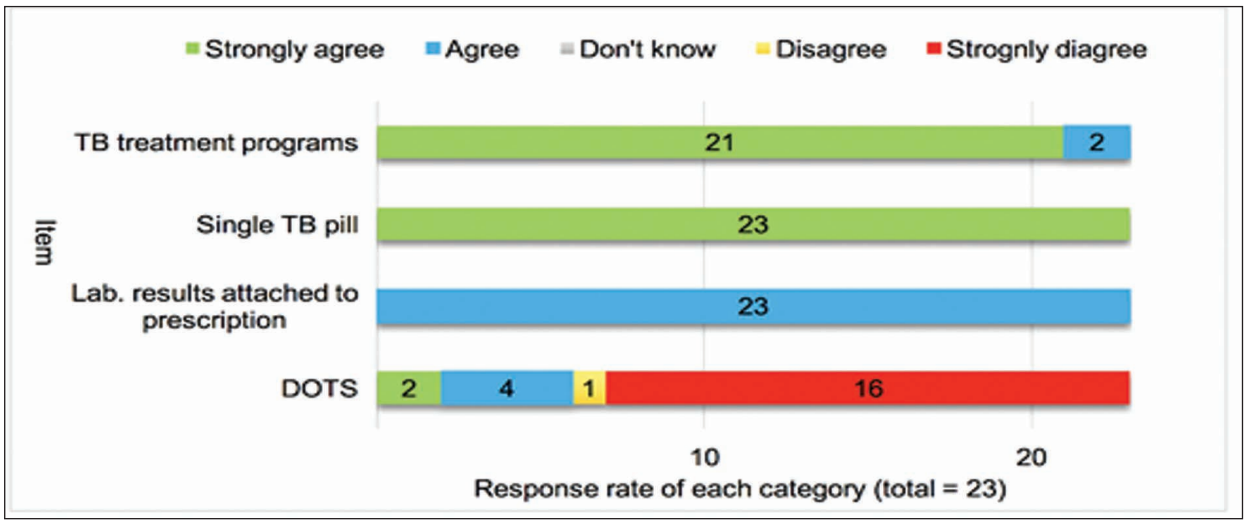

Figure. Attitude of pharmacy dispensing personnel towards different measures to stop TB and promote medication compliance among patients (n=23). DOTS: Directly Observed Treatment Short-course.

DISCUSSION

Knowledge

This study revealed that the majority of drug dispensers have acquired their knowledge of TB care from the National TB Program Sudan, which is based on WHO recommendations. All of them displayed good knowledge of TB medications drug choice. Previous research showed contrary results, though most of these studies were conducted among other healthcare workers. Alene et al.[12.] showed that only 44.6% of the involved Ethiopian healthcare workers correctly answered about nationally recommended MDR-TB treatment regimen. Another study in Southern Mozambique, reported deficient knowledge of intensive and maintenance phase TB drugs among healthcare workers.[13] These results might, however, be influenced by the question format; whether recall or multiple-choice questions were used.

This study also demonstrated the level of knowledge of dispensing personnel in regard to individual TB drugs safety profile in multiple conditions, which is an original addition to the existing literature. It showed that more than 50% of the participants lacked sufficient knowledge to recognize or deal with adverse events in TB patients. Noe et al.[13] reported similar results where the majority of healthcare workers in the study failed to recognize jaundice as a side effect of TB treatment.

Inappropriate drug choice and or drug dose was reported in the present study as the cause of resistant TB by only 39.1% of the participants, as compared to another study where the majority (94.7%) of participating healthcare workers related MDR-TB to improper administration of TB treatment.[13] Dispensing pharmacy personnel showed good knowledge of TB-treatment defaulting, comparable

to those commonly described in literature.[5-8] Most of drug dispensers were also aware of the effective strategies to promote patient compliance; however, it was regarded by the majority as being the patient's responsibility.

Attitude

Although dispensing personnel in this study were aware of MDR-TB and its causes, they still thought that it is, solely, the physician's responsibility to determine the appropriate medication for TB patients. This passive attitude is not unusual in the Sudanese community as it could be explained by the unwelcoming response that pharmacists receive from physicians if the former interfered with the treatment plan, as physicians would feel threatened to lose patient confidence.[10] The majority of the participants showed a supporting attitude for the use of a single TB pill and attaching the laboratory result of the patient to the prescription. These results could include patient sputum status, liver and renal function test, and other important information that would inform pharmacist practice in managing TB patients.

In contrast, the DOTS approach was negatively perceived by most of drug dispenser in this study. This result was unexpected as this strategy is widely applied per WHO recommendation. It was demonstrated that community-based DOTS are more effective and accessible to the patient than clinic-based DOTS.[14,15] which emphasizes the role of community pharmacists in the management of TB cases. The scope of the present study did not allow for further elaboration in the issue; yet this might be attributed to lack of knowledge about DOTS, structural or procedural barriers to DOTS; including increased workload as perceived by dispensing personnel if DOTS is to be conducted by pharmacists. Previous research reported that younger pharmacists, who are involved in TB meetings and workshops and have prior knowledge of DOTS, are more likely to participate in DOTS programs than others.[16]

Practice

The minority of study participants would discontinue the medications prior to referral in cases of adverse events. This might be due to the lack of proper knowledge about TB medications safety as was shown earlier; or more importantly, unclarity of job responsibility as stated in one study; "… I believe the first step in developing our practice is to establish practice standards… I need to know the responsibilities and duties that I should commit to…"[10] Furthermore, there is a discrepancy between dispensing personnel knowledge and their practice regarding medication adherence-promoting strategies.

Linking theory to practice

Low and middle-income countries are in need of effective strategies to control TB. Giving that pharmacist care is usually cheaper and more accessible than physician care; healthcare leaders are encouraged to activate the role of pharmacists in their communities. Previous studies recommend involving community pharmacists in TB case detection, education, and management.[11,17] As was shown in this study, drug dispensers are inadequately trained regarding the safety of TB medications and patient education. A Nigerian study reported improved pharmacy personnel practice in HIV/AIDs and TB cases after engaging stakeholders, changing the infrastructure standards, providing job aids and tool, and pharmacist training.[18] Those included better practice in terms of patient counseling, adverse effects monitoring and patient compliance tracking.[18] Therefore, future interventions should focus on training drug dispensers and establishing collaboration strategies between community drug dispensers and physicians in healthcare institutions.

Limitations and future directions

All dispensing pharmacy personnel in Omdurman locality were surveyed; however, the inherently small sample size might not enable generalizability of our study results. The study, nonetheless, revealed interesting findings such as inadequate knowledge of safety of TB drugs and disagreement about DOTS among study participants, all of which are potential areas for future studies aimed to improve knowledge about these issues and establish the role of pharmacists in TB care.

CONCLUSION

Although dispensing pharmacy personnel displayed good knowledge of TB drugs-regimen, defaulting causes and the overall TB-care, they showed inadequate knowledge about drugs' safety, deficient practice as compared to knowledge, and negative attitude towards DOTS.

Authors' Contributions

DYME has a role in choosing study design and implementing the study and data collection, analysis and interpretation of data, she contributed substantially to the writing of this article, read, edited and approved its final version; SSA has a role in data analysis and interpretation, she contributed substantially to the writing of this article, read, edited and approved its final version.

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Pattern and ENT manifestations of cleft lip and palate in Sudanese children in Khartoum State, Sudan

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ABSTRACT

Background Craniofacial anomalies, and in particular cleft lip and palate, are major human birth defects with a worldwide frequency of 1 in 700 and substantial clinical impact.

Objectives To study pattern and clinical presentations of cleft lip and cleft palate in Sudanese children in Khartoum State.

Patients and methods This is a cross-sectional hospital based study in patients who presented to two of Khartoum State Hospitals with cleft lip and palate during the period from December 2017 to September 2018. The data was collected through a validated questionnaire and clinical examination was done.

Results Seventy-one patients were included in this study. Patients' age ranged from 2 months to 15 years, (mean age 66 ± STD 59 months). The most affected age group was 2 months – 5 years. Male to female ratio was 1.15:1.00. Most of the patients (59.2 %) came from rural communities. The commonest deformity encountered was cleft palate deformity (47.9%) followed by cleft lip (29.6%), cleft lip and palate (19.7%) and submucous cleft palate deformity (2.8%). The commonest presentation was feeding difficulties (73.2 %) followed by speech disorders (47.9%), decreased hearing (8.5%) and recurrent otitis media (7.0 %). The presentation of feeding difficulty was the most common associated symptom with the cleft palate and cleft lip deformities; it was distributed among patients as follow: cleft lip only 71.4 %, cleft palate only 70.5%, cleft lip and palate 92.8 %. Hearing loss was a presentation in all patients with submucous cleft variety.

Conclusion Cleft lip and cleft palate are relatively rare conditions; cleft palate is the commonest deformity among Sudanese children with male predominance and feeding difficulty is the commonest presentation.

Recommendation High attention should be given to medical and paramedical staff for early pick up of these deformities immediately after delivery. The need for national centres for management and rehabilitation of craniofacial malformations cannot be overemphasized.

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INTRODUCTION

Based on World Health Organization report, about 3 million fetuses and infants are born each year with major malformations. Several large population based studies place the incidence of major malformations at about 2–3% of all live births.[1] Murray JC, stated that craniofacial anomalies, and in particular cleft lip and palate, are major human birth defects with a wide variability related to genetic, geographic and socioeconomic status. The worldwide frequency is 1 in 700. In general, Asian or Amerindian populations have the highest frequencies, often at 1/500 or higher, with Caucasian populations intermediate, and African-derived populations the lowest at 1/2500.[2] Specific causes have now been identified for some forms of cleft lip and palate, and we are at the beginning of a time in which the common non-syndromic forms may also have specific aetiologies identified. Mouse models' have an especially important role in disclosing cleft etiologies and providing models for environmental cotriggers

or interventions. An overview of the gene–environment contributions to non syndromic forms of clefting and their implications for developmental biology and clinical counseling is presented.[2] Leslie EJ et al declared that complications of clefting in early life are particularly devastating in developing countries where access to medical care may be limited.[3] Early detection and proper management of these conditions will improve the outcome. The objectives of this research are to study the pattern and clinical presentations of cleft lip and cleft palate in children in Khartoum State.

MATERIALS AND METHODS

This is a cross-sectional hospital-based study. All patients (aged birth-15 years) who presented with cleft lip, cleft palate and cleft lip and palate to Khartoum Ear, Nose and Throat Hospital (KENTH) and to the Maxillofacial Department, Dental Hospital, Khartoum and who gave consent were enrolled in the study. The study was conducted during the period from December 2017 to September 2018. The data is collected using questionnaire. Statistical analysis was performed via SPSS software version 22. Chi-square test was used when appropriate. A p value of < 0.05 was considered statistically significant.

Ethical clearance

The hospitals ethical committees approved the study. Informed verbal consent was obtained from the patients / care-takers after explaining the aim of the study.

RESULTS

A total of seventy-one patients were included in this study. Their ages ranged from to 2 months to 15 years, (mean age 66 ± STD 59 months). The most affected age group was 0 – 5 years (n=42, 59.2%) followed by age group 11 – 15 years (n=17, 23.9%) and 6 – 10 years (n=12, 16.9%). The number of male and females patients was 38 (53.5 %) and 33 (46.5%), respectively with male to female ratio 1.15:1.00; twenty-nine patients (40.8 %) were from urban area and forty-two (59.2 %) were from rural areas**.** As shown in Figure, the commonest deformity encountered was cleft palate only (n=34, 47.9%) followed by cleft lip only (n=21, 29.6%), cleft lip and palate (n=14, 19.7%) and submucous cleft palate (n=2, 2.8 %). The commonest presentations were feeding difficulties in 52 patients (73.2 %) followed by speech disorders in 34 patients (47.9%), decreased hearing in 6 patients (8.5%) and recurrent attacks of otitis media in 5 patients (7 %). Regarding the cleft palate only, there were 34 patients: 19 (26.8 %) patients had complete cleft whereas 15 (21.1 %) patients had incomplete cleft**.** The patients of cleft lip and palate were divided into bilateral and unilateral. Bilateral cleft lip were 4 patients (1 patient was of complete variety and 3 patients were of incomplete variety) and unilateral were 10 patients (3 patient were of complete variety and 7 patients were of incomplete variety)**.**

The presentation of feeding difficulty was the most commonly associated symptom with the cleft Palate and cleft lip deformities; it was distributed among patients as follow: cleft lip only 15/21 (71.4 %), cleft palate only 24/34 (70.5%), cleft lip and palate in 13/14 (92.8 %) patients (Table). All patients with submucous cleft palate have had recurrent otitis media (OM). This finding was found in small percentage (7.6 % and 5.8 %, respectively) in cleft lip and palate as well as cleft palate only; but no patients with cleft lip only had recurrent OM.

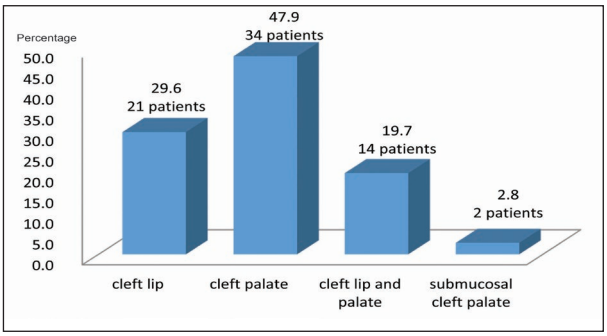

Figure. Distribution of cleft deformities among patients in the study group

Table. The association between cleft deformities and feeding problems in the study group

Deformity	Feeding problem		Total
	Present	Not present	
Cleft lip	15	6	21
Cleft palate	24	10	34
Cleft lip & palate	13	1	14
Submucouscleft palate	0	2	2
Total	52	19	2

P value 0.03

DISCUSSION

Deformities of cleft lip and palate create a challenge for the health care professional involved in their management. The need for an accurate database for cleft registrations as well as systematic record keeping is essential. This is of particular importance when limited resources exist for planning and developing multidisciplinary teams for treating children with cleft lip, cleft palate, or both[4].

In the present study the male gender was dominant (53.5 %) which is in line with reports from the literature. Al Johar et al in KSA and Fakhruddin from Sudan showed higher affection of male gender.[5,6] The study done by Goudy et al reported a high difference in gender distribution (males: 65 and females: 36) which would suggest that a genetic and geographic influence may play a role.[7]

In this study, the majority of patients were from rural area (59.2 %), this correlates well with the study done by Messer et al in Texas,[8] but contradicts with the study of Fakhruddin.[6] This difference may be due to the fact that most our patients were referred from rural area for surgical correction.

In our study, we encountered cleft palate only and cleft lip only to occur in 47.9 % and 29.6 %, respectively; this result differs from a similar local study done by Suleiman who reported respective rates of 30% and 54% for cleft palate and cleft lip.[9] This contradiction is obviously because isolated cleft lip is easier to diagnose while that of cleft palate is easier to miss by the community.

Again, our study contradicts the study done by Al Omari et al in Jordan;[4] it showed most of the patients have clefts of the lip and palate (48%) followed by cleft lip (30 %) and cleft palate (22 %), this could be explained by the fact that the Jordanian study is retrospective with large number of cases, in different times of history, so the significance would not be statistically reliable.

In this study, feeding difficulties was the most common presentation (73.2 %) compared to speech (47.9%) or hearing (8.5%) disorders. This may be because the majority (59%) of our study group was under 5 years, where the feeding problems are more noticeable than the speech or hearing problems. This finding is in line with the study done by de Vries IA et al, where patients with feeding difficulty represented 67 % of the series.[10]

Moreover, in this study, only 6 (8.5%) patients presented with hearing loss, while in the Sheahan study this was a common presentation in 28%.[11] The likely explanations is that the majority of cases of cleft lip/palate malformations encountered in this study were from the maxillofacial department, where hearing assessment is not routinely done (in our set up), as in the Sheahan study. as it was done in ENT department, where the tools for hearing assessment were available.

The recurrent attacks of otitis media in our study was found in 5 patients (7 %), which is lower than the study done by Goudy who found otitis media in 19% of patients;[7] the higher incidence in Goudy study may be due to his larger sample of patients.

Submucous cleft palate in our study was present in only 2 patients; both of them were from KENTH due to familiarity with the condition, both patients presented with hearing loss and recurrent attack of otitis media. This result is not in agreement with Reiter R et al in his study of 439 patients, where 45% of them had problems with hearing loss; the difference may be due to large sample size in that series.[12]

CONCLUSION

Cleft lip and palate are relatively rare conditions with cleft palate being the commonest deformity among Sudanese children and it is more common in rural communities. Feeding difficulty is a common presentation among affected patients. Complete cleft palate is the commonest variety within patients with cleft palate. Therefore in otolaryngology practice, more attention should be paid to the palate especially in children with recurrent otitis media. Early case detection will provide prompt management and prevent further life-long suffering.

RECOMMENDATION

Raising the awareness of the community about antenatal care among pregnant women to take adequate food supplements may guard against foetal deformities. High attention should be given by medical and paramedical staff for early pick up of these deformities immediately after delivery. An expanded program of research for management and rehabilitation protocols should also be established. Not to mention the need for national centres for craniofacial malformations.

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Knowledge and attitudes of mothers regarding care of children receiving chemotherapy in Radiation and Isotopes Centre, Khartoum, Sudan 2017

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ABSTRACT

Background Children and parents are confronted with side effects of chemotherapy at home without being under constant surveillance by the hospital. Therefore, Information and advice to help mothers to understand the side effects of chemotherapy is important. Adequate information is necessary in order that parents, siblings, and other relatives are prepared for the many possible emerging problems.

The aim of this study was to assess knowledge and attitudes of mothers regarding care of children receiving chemotherapy.

Methodology The study is a descriptive cross-sectional and hospital-based. It includes 250 mothers visiting the referral unit at the Radiation and Isotopes Centre of Khartoum (RICK), during the period from August to December 2017. Data was collected using a pretested and validated questionnaire to generate quantitative data.

Results Out of the total of 250**,** 150 (61.2%) mothers had good knowledge regarding chemotherapy. There was significant association between age and the level of knowledge ($p < 0.034$) as well as level of education and knowledge about care at home after chemotherapy session ($p < 0.003$). Only 20% of the mothers would wash their hands before and after preparing food to prevent infection

Conclusion The study concluded that most of the mothers had a good knowledge regarding chemotherapy and it is side effect, fair knowledge about care of physical problems of chemotherapy, and good knowledge about care at home after chemotherapy session. The study found that there is a negative attitude about hygiene, isolation, infection control and food safety.

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INTRODUCTION

Although cancer in children is rare, it is the leading cause of death by disease past infancy among children in the United States where it is estimated that in 2018, 5,590 children and adolescents aged 0 to 19 will be diagnosed with cancer and 1,780 will die of the disease.[1] Survival probability has considerably changed during the past 30 years. Clinical research and practice at pediatric oncology centres has progressively increased the long term survival rate from 20 % before 1975 to 70-80% depending on the specific disease.[2]

Treatment normally requires 1-3 years, followed by checkup for the following 3-7 years. Usually a newly diagnosed child with cancer is critically ill during the first 2-6 months, after that his/her life continues similar to that of a healthy child, except that periodical treatment adjustment and checkup is necessary. The initial treatment is carried out alternating between hospital care and home care; the latter including the general practitioner and paediatrician as well as external nursing under the guidance of paediatric cancer centre.[2] In the 1940s chemotherapy was introduced as a part of standard therapy for childhood cancer.[3] The nursing care regime has to take into consideration the ability of the child and the parents to cope with

the oncological illness: they must be informed about the disease and they have to understand its consequences. Information needs to be adequate in quantity and quality regarding requirements of the child and their entire family, their age, physical and psychological state, their mental resilience, and their familial situation.[2]

Children and parents are confronted with side effects of chemotherapy at home without being under constant surveillance by the hospital.[2] Parents are the prime persons of reference as far as a social network is existent; therefore, parents should be involved in collaboration with the nursing care[2] A previous study concluded that most of the mothers' knowledge regarding care of their children receiving chemotherapy at the National Cancer Institute in Gezira State of Sudan was inadequate.[4] Undoubtedly, mothers can provide their children with comfort, protection from infection, activity regulation, nutrition, skin care, and emotional support. Therefore, they must be adequately informed about the nature of the disease, its course, treatment, complications and prognosis.[5] The objective of this study was to assess knowledge and attitudes of mothers regarding care of children receiving chemotherapy.

METHODS

This is a descriptive cross-sectional hospital-based study conducted at Radiation and Isotopes Centre Khartoum (RICK), which is the first and largest oncology hospital in the country where children are referred from all other states in Sudan. RICK is a specialized hospital that includes nuclear as well as clinical departments with cancer expertise e.g. radiotherapists, medical/paediatric oncologists, nuclear medicine specialists, diagnostic radiologists, and patients' social and psychological services.

The study enrolled mothers of children receiving chemotherapy for more than 6 months and who attended RICK during the study period. The study adopted the non-probability (convenience) sampling technique. The sample size was calculated to be 250. The data was collected by interviewing the mothers. The questionnaire included personal, demographic data, knowledge of the mothers about chemotherapy (concept, purpose, side effects, and care at home) and their attitudes towards care at home (physical hygiene, food, drug, activity). A 5-point Likert Scale using type forms of multiple choice questions was used to assess attitudes. A successful pilot test on mothers with the same criteria of the study population was done to validate the questionnaire. Data analysis was carried out using the Statistical Package for Social Sciences (SPSS) version 21 and p value < 0.05 was considered significant.

Ethical approval was obtained from the Research Committee at Al-Neelain University and a written agreement was obtained from the State Ministry of Health, Department of Research, as well as from the managers of the RICK. An informed verbal consent was obtained from each participant.

RESULTS

A total of 250 mothers of children receiving chemotherapy were interviewed; their characteristics are shown in Table 1. Most of the mothers' age ranged between 31-40 years, nearly one-third (32.8%) completed university education, the majority of them (68.4%) were housewives, 31.6% were employees and 68% of them had low income.

The majority (61%) of the interviewed mothers had good knowledge about the side effects of chemotherapy (Figure 1); 121(48.4%) and 70(28.0%) mothers had good and fair knowledge, respectively, about the physical problems of chemotherapy. More than half of the participant had very good knowledge about care at home after chemotherapy session (Figure 2). There was significant association between the level of the mothers' knowledge about care at home after chemotherapy session and their age ($p<0.034$) as well as their educational level ($p<0.003$) as shown in Table 2.

About one-third of the mothers would put their children in bed to rest when they feel pain (Table 3). However, only 20% of the mothers would wash

their hands before and after preparing food to prevent infection (Table 4).

Table 1. Demographic data of mothers

Percentage	Item	Frequency%
Age		
less than 20	5	2.0
20-25	0	0
26-30	78	31.2
31-40	133	53.2
above 40	34	13.6
Total	250	100.0
level of education		
Illiterate	50	20.0
Basic education	38	15.2
Secondary school	70	28.0
University	82	32.
Above university	10	4.0
Total	250	100.0
Monthly income		
High	40	16.0
Moderate	39	15.6
Low	171	68.4
Total	250	100.0
Marital status		
Married	159	63.6
Divorced	10	4.0
Widowed	81	32.4
Total	250	100.0
Housing condition:		
Rent	104	41.6
Own house	146	58.4
Total	250	100.0

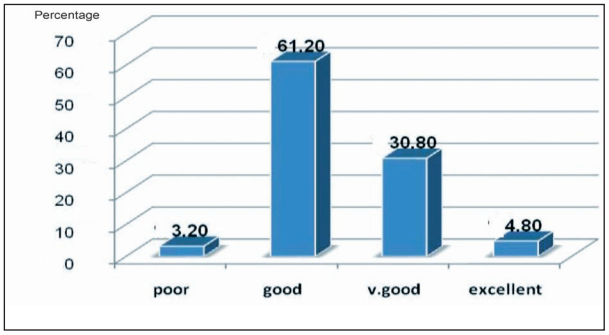

Figure I. Level of mothers' knowledge about the side effects of chemotherapy

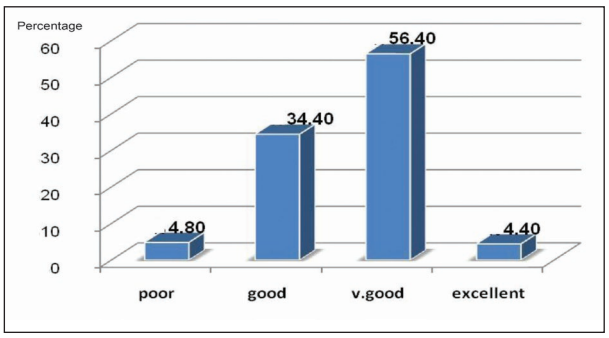

Figure 2. Level of mothers' knowledge about care at home after chemotherapy session

Table 2. Association between mothers' age, level of education and the level of mothers' knowledge about care at home after chemotherapy session

Background variable	Dependent variable	p-value
Mother age	Level of knowledge about care at home after chemotherapy session	0.034
Mother Education level	Level of knowledge about care at home after chemotherapy session	0.003

Table 3. Attitude of mothers when the child feels pain

	Strongly Agree		Agree		Neutral agree		Disagree		Strongly Disagree	
	n	%	n	%	n	%	n	%	n	%
1. Limit movement	17	6.8	77	30.8	0	0	52	20.8	9	3.6
2. Bed rest	17	6.8	**81**	32.4	0	0	61	24.4	9	3.6
3. massage	16	6.4	60	24.0	0	0	33	13.2	2	0.8
4. Watching TV	16	6.4	58	23.2	0	0	24	9.6	2	0.8

Table 4. Attitudes of mothers towards preventing infection

	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree	
	n	%	n	%	n	%	n	%	n	%
1. Hand washing before and after preparing food	33	13.2	30	12	50	20	23	9.2	5	2
2. Avoid contact with ill Child	34	13.6	31	12.4	45	18	20	8	4	1.6
3. Avoid over crowding	33	13.2	29	11.6	44	17.6	34	13.6	2	0.8
4. Avoid staying in dusty area	35	14	24	9.6	41	16.4	25	10	1	0.4
5. Give balanced diet	34	13.6	21	8.4	40	16	14	5.6	4	1.6

DISCUSSION

The present study revealed that the ages of over half of the mothers enrolled, ranged between 31-40 years and that the level of education of one third of the participants was at the university level. Maternal academic education has been linked to increased knowledge of mothers about the care of their children; therefore, literacy acquired at school ensures that mothers are more capable of identifying health problems in their children. A study conducted in Egypt which aimed to assess knowledge and home practices of caregivers having children with leukemia found that: more than half (55.8%) of the caregivers were aged between 35-45 years and 41.4% of them had secondary school education.[6] The present study revealed that most of the mothers (68.4%) were housewives. This latter result is comparable with the study conducted in Nanakali Hospital in Erbil City (North of Baghdad, Iraq) which aimed to assess home care management for caregivers having leukemic adolescent patients and which found that 76.3% of mothers were housewives.[7] In the current study, 68.4% of the families had low income. Regarding marital status, the study found that most of the interviewed mothers (60.0%) were married. This percentage is comparable to a percentage scored by a corresponding result of a study done in Thailand which found that 74% of mothers were married.[8] The present study found that 61% of the interviewed mothers had good knowledge about the side effects of chemotherapy. The known side effects of chemotherapy are: fatigue, nausea and

vomiting, loss of appetite, diarrhea, hair loss, low blood cell counts (CBC), sore mouth and throat, tiredness, confusion, and depression.[7] Knowledge about the side effects is vitally important for early treatment and prevention of complications.

Regarding the level of mothers' knowledge about the physical problems of their children receiving chemotherapy, the study found that nearly three quarters of the interviewed mothers proved to have good (and fair) knowledge. This result is in disagreement with a study done by Mawad at Banha University aiming to assess mothers' knowledge about the physical problems of their children receiving chemotherapy which found only 16% of the mothers reported good knowledge.[9] Regarding mothers' knowledge about care at home after chemotherapy session and continuity of care, the study revealed that 56.4% of the mothers reported very good knowledge. This result compares with Mawad's study mentioned above which found that most of the mothers enrolled in that study showed excellent knowledge about care at home after chemotherapy.

Approximately one-third of the mothers enrolled in this study would put their children in bed to rest when they feel pain. This result is in disagreement with the information provided in the reviewed literature on the management of symptoms caused by cancer or cancer therapy at home in which the following interventions were enumerated: massage therapy, telephone intervention, self-efficacy improvement, coping enhancement and multi-dimensional intervention.[10]

In this study, only twenty percent of the mothers would wash their hands before and after preparing food to prevent infection. This result is in disagreement with Mawad's study which showed that most of the mothers care was excellent as detailed as: gentle hygiene (91%), safe food (86%) and hand washing (84%).[9] Prevention of infection is very important when the child is receiving chemotherapy as the child usually has compromised immune system.

The present study indicated significant association between the demographic variables namely age and level of education and the level of the mothers' knowledge about care at home after chemotherapy session ($p < 0.034$ and $p < 0.003$, respectively). This result compares with Mawad's study which revealed statistically significant association between the level of the respondents' knowledge with age and level of education ($p < 0.05$, and $p < 0.001$, respectively).[9]

In conclusion, this study showed that mothers of children receiving chemotherapy had good knowledge about chemotherapy, the side effects and home care after chemotherapy session. However their attitude towards hygiene, isolation, infection control and food safety is not satisfactory. This emphasizes the need for health education and sympathetic coaching.

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Case report

Massive progressive scroto-perineal eumycetoma and its therapeutic challenges.

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Case 1

A 57 year-old male, from central Sudan, presented to the Mycetoma Research Centre (MRC), Khartoum, Sudan, with a slowly progressive right inguino-scrotal swelling of 35 years duration. He also reported local scrotal pain and itching. The swelling was first noted in 1982 as a small painless mass in the lower inner quadrant of the right gluteal region. By 2005, it progressively increased in size and a purulent discharge containing black grains appeared. The patient did not recall any history of local trauma. He underwent surgical excision under local anaesthesia at a regional hospital. Two years later he developed local recurrence that extended to the perineal area just below the scrotum that started to discharge pus and black grains. He underwent further surgical excision under spinal anaesthesia. However, following these surgical excisions, no tissue diagnosis was established, and no treatment was given.

In 2010, he presented to the MRC complaining of right hemiscrotal painless swelling of six months duration. Clinical examination revealed a mass measuring 5×4 cm, with multiple sinuses discharging pus and black grains; it was soft in consistency and was attached to the skin and deep structures. The diagnosis of *Madurella mycetomatis* eumycetoma was established by cytological examination of fine needle aspirate from the lesion.

He was commenced on 200mg ketoconazole twice daily orally and folic acid 5 mg once a day orally. Two months later he underwent wide local excision at the MRC under spinal anaesthesia. He remained inpatient for 45 days for daily wound dressing and was discharged in good condition. He then had reconstructive plastic surgery to cover the open wound by a skin graft.

A follow-up ultrasound examination three months later identified local recurrence. Sadly, he stopped taking his medications due to social reasons. In 2013 he presented to the MRC with local recurrence, and the lesion ultrasound examination revealed right testicular invasion. He was commenced on 200 mg itraconazole twice daily orally, and folic acid tabs 5 mg once a day; however, the swelling did not regress in size with treatment.

Four years later, in 2017, the patient noticed a rapid increase in the swelling, which extended to the right inguinal region. Seven months prior to his presentation, he developed scrotal pain and itching, which was of low grade and mainly nocturnally. He had no constitutional symptoms.

The patient is diabetic on 500mg metformin twice daily for four years. He was not on other long-term medication. He has a family history of mycetoma; his brother had a right foot eumycetoma. He worked as a cashier, married with 12 children and the youngest is 12-year-old.

On clinical examination, the patient looked well, neither pale, jaundiced, nor cyanosed. He had no

difficulty in walking. Local examination revealed massive swelling at the right inguinal region and the right hemi-scrotum with no superficial dilated veins. There were multiple active sinuses discharging pus, blood and black grains. It was not tender on palpation. It was soft in consistency, not mobile and was attached to the skin. Fluctuation test was negative. Transillumination test was negative, (Figure1).

Figure 1. The scrotal swelling with multiple active sinuses discharging pus, blood and black grains.

A complete blood count showed leucocytosis with total white blood cells counts (TWBC) of 12.100 cells/ml, a low haemoglobin concentration of 6.6 g/dl, and thrombocytosis (532.000/dl). Random blood glucose level was 171 mg/dl. A swab was collected from the sinuses for culture and drug sensitivity, but no organism was isolated. Renal and liver profiles were normal. Grains were collected for culture and a polymerase chain reaction (PCR), and it was positive for *Madurella mycetomatis.*

The Interleukin IL-12 and IL-4 levels were measured by ELISA test. IL-12 concentration was higher compared to the healthy control sample ($p < 0.01$) while IL-4 was decreased significantly compared with the healthy control sample ($p < 0.01$). Interleukin (IL)-12 links the innate immunity with the development of adaptive immunity and is also important for regulating T cell responses, and it was reported to be important during systemic infection. Interleukin (IL)-4 is a type-2 response that elicits the production of non-opsonizing antibodies and allergic reactions and down regulates the extensive inflammatory reaction caused by Th1 cytokines.

Abdominal and pelvic ultrasound examination showed multiple connected pockets of fluid containing grains associated with right scrotal hydrocele, (Figure 2).

Figure 2. Scrotal ultrasound examination showing multiple connected pockets of fluid containing grains and right scrotal hydrocele.

Pelvic X-ray excluded bone involvement. Two months later MRI revealed that the mycetoma had invaded of the right epididymis and ascended along the spermatic cord and ended proximally at the level just below the tubercle of the right pubic bone with the involvement of the posterolateral aspect of the right hemiscrotum, the scrotal septum. No detectable lesion was seen in the left hemiscrotum and the urogenital triangle, (Figure 3).

On 8th of February 2018, the patient underwent wide local excision of the right hemiscrotum with excision of the right testis and epididymis under spinal anaesthesia with uneventful postoperative recovery. He was followed at the out-clinic, but he was lost for follow up.

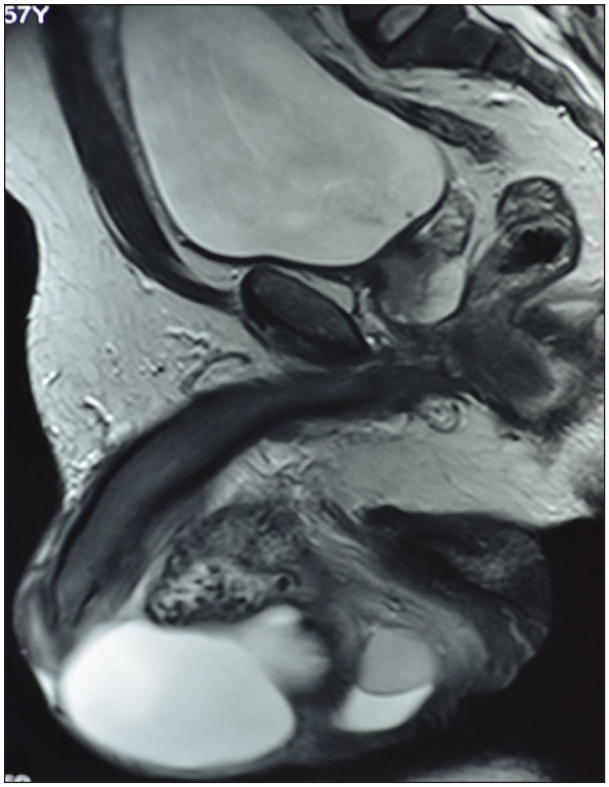

Figure 3. MRI showing mycetoma invading the right epididymis, ascending along the spermatic cord ending proximally at the level just below the tubercle of the right pubic b one with the involvement of the posterolateral aspect of the right hemiscrotum and the scrotal septum.

Case 2

A 34 year-old male, from the central part of Sudan known case of scrotal and perineal *Madurella mycetomatis* eumycetoma was recently seen at the MRC. He was first seen and diagnosed at the MRC four years previously, but he was not on regular follow up at the centre. At presentation, he had a painless large inguinal swelling extending to the left hemi-scrotum. The condition actually started in 2007 with painless small swelling in the left gluteal region that gradually increased in size. He has no history of local trauma. He underwent several wide local surgical excisions in 2009, 2010, 2011 and another two excisions in 2017. All previous surgeries were done under spinal anaesthesia and were uneventful without complications. The patient has neither a family history of the same condition nor other conditions. He was not on long-term medication apart of oral 200mg itraconazole twice a day and folic acid 5 mg once a day for his eumycetoma. There is no history of allergy or other co-morbidity. The patient is a freelancer worker of low socioeconomic status. He is married with two children; five and three years old. The systemic enquiry was unremarkable.

On examination, he looked well, and had no difficulty in walking. His blood pressure was 120/70 mmHg, pulse rate 60 b/min and respiratory rate was 22 breath/min. Systematic clinical examination revealed no abnormality. Local examination revealed a long surgical scar extending obliquely along the left lower half of the gluteal region extending into the inner aspect of the left perineal region, (Figure 4A &4B). The patient has an extensive swelling involving the perineal region spreading to the left hemi-scrotum with multiple sinuses discharging offensive pus and black grains. The swelling was firm in consistency, not tender with normal temperature, not mobile and was attached to the skin. Fluctuation and trans-illumination tests were negative. There were no palpable inguinal lymph nodes and no superficial dilated veins.

Figure 4A. the long surgical scar is extending obliquely along the left lower half of the gluteal region into the inner aspect of the left perineal region.

Figure 4B. Showing an extensive swelling involving the perineal region spreading to the left hemiscrotum with multiple sinuses.

MRI showed a mass occupying the left perineal fat tissue and mildly extending to the right side and also involving the left side of the scrotum, and the gluteal region (Figure 5A & 5B). Grains PCR examination revealed *Madurella mycetomatis.*

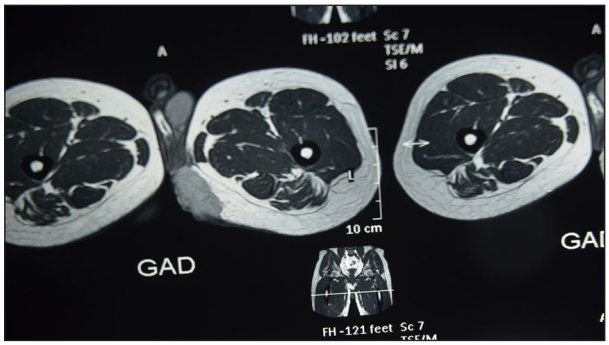

Figure 5 A. MRI showing a mass occupying the left perineal fat tissue and mildly extending to the right side and gluteal region.

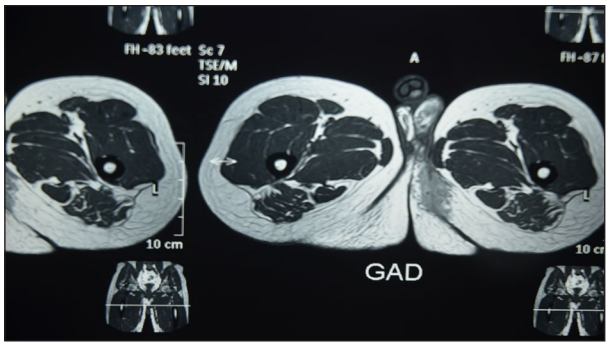

Figure 5B. MRI showing the swelling involving the perineal and left side of the scrotum.

The patient was admitted to the hospital. A complete blood count showed TWBCs count of 6000 cells/ml, with normal differential parameters, haemoglobin of 14.8 g/dl, normal platelets count. Random blood glucose level was 92 mg/dl. Renal function revealed urea of 16 mg/dl, creatinine of 0.9 mg/dl, Na^+ of 139 mmol/l and K^+ of 3.8 mmol/l. Viral screening for HBV, HCV and HIV were non-reactive. A swab was collected from the sinuses discharge for micro-organisms culture, and antimicrobial agents' sensitivity revealed the growth of *Escherichia coli* which was sensitive to Cefuroxime of which he received 750 mg three times a day for two weeks.

He was started on oral 200 mg itraconazole twice daily and folic acid 5mg once daily. He underwent wide local excision and left orchiectomy. The wound was closed primarily, and he had uneventful postoperative recovery. He is not on regular follow up now.

DISCUSSION

Mycetoma is an unparalleled, devastating neglected tropical disease caused by several microorganisms of fungal or bacterial origin.[1] Hence it is classified as eumycetoma and actinomycetoma, respectively.[2] It is endemic in many tropical and subtropical countries and Sudan seems to be the mycetoma homeland.[3] The geographical distribution of mycetoma depends on certain environmental factors such as rainfall, humidity and temperature.[4] Mycetoma frequently affects the extremities; the foot and hand.[5] Less commonly affected sites include the leg, knee, chest wall, head and neck.[6,7,8] An extensive review of the medical literature had revealed few reported scrotal mycetoma patients.[5,9]

In this communication, both patients had eumycetoma caused by *Madurella mycetomatis,* which is the commonest causative organism in Sudan.[10] Mycetoma is believed to occur as a result of traumatic implantation of the causative organism into the subcutaneous tissue via minor trauma or injury.[11] However, both patients denied a history of local trauma at the mycetoma site. It may be minor injuries passed unnoticed. In the poor

rural community, due to water shortage and poor socioeconomic and health education levels, some people use soil to clean themselves after defecation, and that may be an important mechanism for the causative organism inoculation for scrotal and perineal mycetoma.[5]

Both patients had the mycetoma pathognomonic triad of the painless subcutaneous mass, multiple sinuses, and purulent or seropurulent discharge containing coloured grains.[1,2,3] The painless nature of the disease is likely to be an important cause for the late presentation of these patients. Furthermore, many patients if developed medical problems in the genital regions do not present early for medical advice as that is considered as a social stigma in many communities in Sudan and that may also be the cause of the late presentation of the patients reported here.

In mycetoma, the external appearance is always deceiving and misleading, as seen in the reported patients. Both of them had an extensive inguinoscrotal invasion and few cutaneous signs. Hence, surgery under local anaesthesia is contraindicated as wide local surgical excision is frequently incomplete. Suboptimal excision is always associated with local recurrence and sometime with distal spread.[12] This was evidenced in the reported patients. A tourniquet bloodless field surgery is mandatory in mycetoma for adequate wide local excision, and this was not feasible in these patients and thus the multiple recurrences.[12] The complexity of the scrotal, perineal, gluteal and inguinal anatomy always makes radical surgical excisions incomplete and can contribute to the high recurrences seen in these patients.[12]

It is interesting to note in spite of the long-standing extensive disease in the inguinal, perineal and scrotal regions the patients were sexually active. The first patient had 12 children, and the second one had two. It is interesting to note although the disease had deeply invaded the deep tissue, the hip joints were not involved, and their gaits were normal.

In the first patient, the cytokine IL-12 level was significantly increased compared to healthy controls. Nevertheless, the patient had a significantly lower level of IL-4. The study results suggested that cytokine responses induced by *Madurella mycetomatis* during the course of infection may play an important role in the differences in the pathogenicity. It seems likely that the antifungal treatment might have exerted immunomodulatory effects through the increase of the pro-inflammatory cytokine IL-12 and the decrease in the anti-inflammatory cytokines IL-4. Unfortunately, only a small fraction of cytokines was tested in this study, thus more Th1 and Th2 cytokines should be further assessed in those patients for a better understanding of the disease pathogenesis.

The reported patients are of low socioeconomic status and health education level, and they came from remote rural areas with scarcity of medical and health facilities. They were operated on by poorly trained medical assistants under local anaesthesia in low-resources medical centres. This would have contributed to the high recurrence rates encountered among these patients. In spite of the multiple surgical excisions, no surgical biopsies were taken, and no diagnosis was established. To avoid this poor practice, objective training of general practitioners and medical assistants, particularly in mycetoma endemic areas is mandatory and is currently being pursued.[13]

A careful preoperative assessment of the disease extension among the different tissues planes is always essential to plan the type of surgery.[14] MRI proved to be useful and accurate in determining the disease extension.[15]

Many mycetoma patients require reconstructive plastic surgical treatment following the lesions wide surgical excision. Thus it is helpful to have a plastic surgeon as part of the multidisciplinary team. In mycetoma, the open surgical wounds need special attention, necessitating hospital admission for proper wound care, daily dressing under aseptic conditions using appropriate dressing solutions and dressing material and infection surveillance with

frequent swab culture and antibiotic therapy when required.

These two cases of scroto-perineal eumycetoma illustrate the management and therapeutic challenges and the importance of a multidisciplinary team in the management of mycetoma patients.

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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.

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