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The Knowledge and Attitude of The Community Pharmacists Toward Rational Dispensing of Non-Steroidal Anti-Inflammatory Drugs in Dhamar governorate: A Community Pharmacy- Based Survey

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Abstract:

Background: The community pharmacy service should be a frequent source of the medication information for patients, however in Yemen, little is known about pharmacists' provision of safety information to patients for management and prevention of the drugs adverse effects.

Objective: to evaluate range of awareness of community pharmacists in screening patients for risk factors before supplyin g Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) and provid ing information about potential adverse effects and their management.

Methods: A cross-sectional questionnaire-based study has been performed from March 1, up to April 30, 2021. Knowledge and role of 236 community pharmacists in screening and communication with patients regarding risk factors before dispensing of NSAIDs were investigated.

Results: The majority of the participants (86.9%) recorded having proper knowledge about the NSAIDs, whereas 13.1%

revealed that their knowledge about NSAIDs was bad. The majority of risk factors that pharmacists discussed with patients for both non-selective and selective NSAIDs were pregnant and breastfeeding women. Large number of community pharmacists claimed to advice the patients to use non-selective and selective NSAIDs after a meal for purpose of preventing of gastrointestinal complications.

Conclusions: Although the evidence of high screening of risk factors, counseling and provision of information and management for patients using NSAIDs by the large number of community pharmacists at study area, alarmingly slightly high number of the pharmacists still have insufficient knowledge regarding both classes of NSAIDs and the risk factors for their use. This calls for improving of under- and postgraduate educational strategies, not only to elevate the knowledge, but also to change the behavior and practices among pharmacists to prevent potential medication –related problems.

Keywords: Community pharmacists, NSAIDs, screening, knowledge, counseling.

Introduction

Non-steroidal anti-inflammatory drugs (NSAIDs) and acetaminophen, are the most common over-the-counter (OTC) drugs in the world. **NSAIDs** by blocking act the cyclooxygenase (COX) enzyme, which causes direct inhibition of the biosynthesis of prostaglandins and thromboxane from arachidonic acid. They analgesic. have antipyretic, and anti-inflammatory actions. They are used for treating mild-to-moderate pain that arises from a variety of conditions such as osteoarthritis, rheumatoid arthritis, menstruation, headaches, or toothaches[1].

United States (the In the US) itself. approximately 2% of the US population consumes an analgesic, antipyretic or NSAIDS each day. This is even more common among elderly patients, where 10-20% have a current or recent NSAIDS prescription [2]. The prevalence of NSAIDS use in Thailand is similar to that in the US but Thai patients can obtain NSAIDs without prescription from pharmacies, even those not classified as over the counter (OTC) drugs [3]. Moreover, a recent study in Thailand reported that 30% of people in rural areas use NSAIDs often,[4].

In Saudi Arabia, analgesics were one of the top 10 most used drugs between 2010 and 2015 and the NSAIDs class represented 67% of use [5]. Also many studies in Saudi Arabia found that the majority of people use the NSAIDs, especially ibuprofen and diclofenac to treat headaches, colds, cramps, and fever. As well as, a recent study in Saudi Arabia found that around one-half of the participants in the study practiced selfmedication with NSAIDs primarily for pain management [6, 7].

NSAIDs can cause severe side effects such as GI mucosa injuries, allergic reactions, a tendency towards bleeding, liver or kidney problems, and high blood pressure [8]. The non-selective NSAIDs like aspirin are more likely to cause adverse GI effects. which vary from asymptomatic endoscopic erosions to ulcers which complicated with bleeding, perforation, and stenosis. However, selectively target COX-2 like celecoxib have a higher risk of negative cardiovascular effects [8,9].

The GI toxicity of NSAIDs has been explored in a large number of epidemiological studies and clinical trials [10]. The researchers founded that about 1 out 100 patients who used aspirin for a mean of 28 months had developed GI bleeding in meta-analysis of 24 randomized controlled trials [11]. In Thailand, NSAIDs were the second most frequently reported drugs in the spontaneous reporting system for Adverse Drug Reaction (ADRs) between 1984 and 2017 [12].

Since, NSAIDs use is widespread, all healthcare professionals should have a duty to identify whether patients have factors potentially increasing the risk of adverse effects before supplying them. In practice, however, studies in

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several countries show frequent prescribing of NSAIDs in patients with risk factors [13, 14]. Also use of NSAIDs is common in older patients and in combination with drugs likely to cause serious drug-drug interactions [15]. Furthermore out-patients' awareness about the risks of NSAIDs is lower than desirable and their perceptions concerning these risks are much lower than that of healthcare professionals [16]. Consequently, community pharmacy-based interventions in relation to NSAIDs can prevent serious long-term problem, including acute kidney injury and GI complications, and can positively impact on patient knowledge by providing safety information about the NSAIDs products [16, 17].

In Yemen, NSAIDs can be obtained legally either from a doctor who describes the drug in the course of the therapy of a disease or from a pharmacist with or without a prescription. Moreover, Yemen has no guidelines concerning risk screening and information provision to inform best practice for community pharmacists. Also, there is no or little work has studied the practices of community pharmacists in Yemen. [17]. Therefore this study carried out to evaluate the awareness, knowledge and attitudes of community pharmacists in screening patients for risk factors and to determine the recommendations and information that the community pharmacists given to patients ISSN: 2710 – 4877 (P); 2710 – 4885 (E)

regarding potential ADRs and their management when dispensing of NSAIDs.

Materials and Methods

Study area

The current study was conducted on community pharmacies in Dhamar governorate, which located about 100 kilometers south of the capital city of Yemen, Sana'a. Dhamar governorate was chosen because of the socioeconomic status of the population living in this region, where medication dispensing without prescription is a very common practice.

Study period

Data were collected during the period of two months, from March 1, up to April 30, 2021.

Study design

A cross-sectional questionnaire-based study. Knowledge and role of community pharmacists in screening and communication with the risks regarding with the dispensing of NSAIDs were investigated.

Study tool

A pre-tested, semi- structured questionnaire containing both open- and close-ended and multiple-choice questions. The questionnaire was initially developed in English language, translated into Arabic language, and backtranslated into English language to validate the translation, and ensure accuracy.

Validation and pre-testing of questionnaire

The 15-item questionnaire was pretested among fifteen community pharmacists, so as to ascertain the appropriateness of sampling procedure, ensure easy comprehension of the questionnaire, and to revise and finalize the questionnaire. Feedback from the pre-test and validity assessment was considered and corrections were made accordingly. Originally the questionnaire was designed to be self-administrated but based on the lower response during the pre-test, decision was made by the researcher to modify the questionnaire from self -administrated questionnaire to face to face questionnaire. The fifteen community pharmacists were subsequently excluded from the main analysis of the sample of this study.

The final version of questionnaire was divided to two parts and consisted of nineteen close-ended and four open-ended questions. **Part A**, contained eleven items and were pertained to collect socio-demographic characteristics of the pharmacists, including gender, age, marital status, place of residence, the level of education, the number of years of practice experience, pharmacy owner, number of staff in pharmacy, internship program, and number of patients per day. **Part B**, contained 12 items and were pertained to evaluate the pharmacists' role in

supplying NSAIDs. The participants were asked to indicate to the type of NSAIDs, screening patients at risk and assessment of the necessity for using NSAIDs were evaluated. As well as, the participants asked about how were communicating potential adverse effects, and which are advices on how to manage and prevent advice on the things that patients should or should not do while taking NSAIDs. Each question provided options related to frequency of practice, such as regularly, occasionally, or never, in addition to those for indicating communication. ADR and management, additional details were requested.

Sample Size

The final version of the questionnaire was randomly distributed to 363 pharmacists practicing in community pharmacies during the study period. Out of 363 questionnaires, only 236 questionnaires were completed and returned back. Sixty of questionnaires were returned but were not completed, 52 of questionnaires are not filed by participants who lack of interest and refused the participation in this study, whereas, 15 of questionnaires are not returned at all, as seen in Table 1.

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Type or response	NO. of questionnaires
Returned complete	236
Returned incomplete	60
Not filed by participants	52
Not returned at all.	15
Total	363

Table 1. Distribution of sample of study according to the type of response

Inclusion and exclusion criteria

All male and female pharmacists, who worked in community pharmacies, and completed all the parts of the questionnaire were included. Community pharmacists who not complete all the parts of questionnaire were excluded from the study.

Study procedure

During the distribution of the questionnaire to the pharmacists in the selected community pharmacies, an explanation of the purpose of the study and assurance of anonymity were provided to participants, as well as, verbal informed consents were obtained. All the community pharmacists were asked to fill out the questionnaire in the presence of the coinvestigators should any respondent require any assistance in filling the questionnaire. After the pharmacists completed the questionnaire, the questionnaire manually was collected and the questionnaire's data were reviewed. and tabulated to facilitate the statistical analysis.

Data analysis

The data was entered after looking for incomplete responses and analyzed by using the Statistical Package for Social Sciences (SPSS) for windows version 22. Qualitative data was described as numbers and percentages. Chi square test was used to test the association between group variables and level of significant was accepted as (P value < 0.05). Some questions containing multiple responses by study participants and hence the sum of percentages is not always 100%.

Ethical approval

The protocol of this study was approved by faculty of medical sciences, Al-Saeeda University. A verbal consent was obtained from each participating community pharmacists in charge to participate in the questionnaire. The participation was voluntary and without any incentive or pressure from co-investigators. Any information that exposes the identity of the

met the inclusion criteria, giving a response rate

of 65%. The Sociodemographic characteristics of

the study participants are as presented in Table 2.

pharmacist who participate in the questionnaire was avoided.

Results

Response rate and demographic details

A total of 236 out of 363 administered

questionnaires were returned fully completed and

Table 2.Characteristics of community pharmacists during period of study.

Characteristics	N (%)
Gender	
Male	233 (98.7)
Female	3(1.3)
Age (year)	
20- < 30	163 (69.1)
30-50	72 (30.5)
>50	1 (0.4)
Niean± S.D	31.4 ±11.7
Place of residence	206(97.2)
Bural	200(87.5) 30 (12 7)
Educational level	50 (12.7)
Bachalar	101 (51 0)
Dinloma	121 (51.5) 115 (48 7)
Years of experience	113 (+0.7)
<10	1/8 (/5.4) E1 (21.6)
21_20	7 (2)
Mean+ S.D	99+62
Have assistant in pharmacy	
Yes	191 (80.9)
NO Dharmany average	45 (19.1)
Pharmacy owners	
Yes	132 (56)
No	104 (44)
No. of pharmacist in pharmacy	212 (00.2)
1-2 \2	213 (90.3)
Working hours	23 (5.7)
<10	32 (13.6)
10-12	98 (41.5)
>12	106(44.9)
Total	236 (100)

The majority of participants were males (98.7%), with Bachelor qualification (51.3%), and with mean years of practice experience (9.9 \pm 6.2) years. The mean age of participants was (31.4 \pm 11.7), and there was a preponderance of those belonged to the age group of twenty to less than thirty years 163 (69.1%). One hundred and thirty two (56%) of respondents were owners of pharmacies, whereas, 104 (44%) of respondents were working in independently owned pharmacies. The majority of the community pharmacies were located in Dhamar city 206 (87.3%), and most of them 213 (90.3%) had less than two community pharmacists. Other demographic details are shown in Table 2.

Knowledge of NSAIDS information

Range of knowledge of the community pharmacists about non-selective and selective NSAIDs are illustrated in Table 3. The majority of the participants (86.9%) recorded having proper knowledge about the NSAIDs, whereas 13.1% revealed that their knowledge about NSAIDs was bad. About 70.3% and 61.9% of community pharmacists revealed appropriate knowledge regarding non-selective and selective NSAIDs respectively.

Table 3.	Community	pharmacists'	knowledge	regarding	NSAIDs and	nd their types
		I				

NSAIDs Types		No. of pharmacists (%	
General			
Bad		31 (13.1)	
Good	59(25)		67 (28.4)
Very good		79 (33.5)	
Excellent			
Non-selective			
Bad		70 (29.7)	
Good		72(30.5)	
Very good		43 (18.2)	
Excellent		51(21.6)	
Selective			
Bad		89 (37.7)	
Good	61(25.8)		34 (14.1)
Very good		52(22)	
Excellent			

Screening of risk factors before the use of NSAIDs

The frequency of community pharmacists' selfreported practice regarding screening of risk factors for the use of NSAIDs are outlined in Table 4. The majority of the community pharmacists reported that they always performed a proper self-reported risk factor screening for specific conditions when they are dispensing NSAIDs. The commonly risk factors that community pharmacists discussed with patients for either non-selective or selective NSAIDs were pregnancy and breastfeeding, followed by history of GI ulcers/bleeding, and uncontrolled hypertension..

 Table 4. Community pharmacists' self-reported risk factor screening for certain conditions before

 use of NSAIDs

Details on screening of risk factors	No. of community pharmacists (%)		
	Always	sometimes	Never
Dispensing of non-selective NSAIDs			
History of GI ulcer/bleeding	167 (70.8)	56 (23.7)	13 (5.5)
History of renal impairment	21 (8.9)	117 (49.6)	98(41.5)
History of liver impairment	97 (41.1)	100(42.4)	39 (16.5)
Cardiovascular disease	78 (33.1)	132 (55.9)	26 (11)
Older age	145 (61.4)	71(30.1)	20(8.5)
Pregnancy breast feeding	181 (76.7)	41 (17.4)	14 (5.9)
Uncontrolled hypertension	148 (62.7)	68 (28.8)	20 (8.5)
Multiple NSAIDs/long term/high Dose	117 (49.6)	83 (35.2)	36 (15.3)
Taking steroid drug	97 (41.1)	96 (40.7)	43 (18.2)
Dispensing of selective COX-2 NSAIDs			
History of GI ulcer/bleeding	157 (66.5)	64 (27.1)	15 (6.4)
History of renal impairment	133 (56.4)	83(35.2)	20 (8.5)
History of liver impairment	120 (50.8)	80 (33.9)	36 (15.3)
Cardiovascular disease	127 (53.8)	87 (36.9)	22 (9.3)
Older age	132(55.9)	80 (33.9)	24 (10.2)
Pregnancy breast feeding	166 (70.3)	61 (25.8)	9 (3.8)
Uncontrolled hypertension	135 (57.2)	74 (31.4)	27 (11.4)
Multiple NSAIDs/long term/high Dose	117 (49.6)	81 (34.3)	39 (16.1)
Taking steroid drug	108(45.7)	86 (36.4)	42 (17.8)

Prevention and management of side effects of the different classes of NSAIDs

Table 5 shows the descriptive data which focused on the most frequently reported advice regarding how to prevent or manage the side effects for the different classes of NSAIDs. For non-selective NSAIDs, pharmacists' most mutual input to prevent GI complications was to take NSAIDs after a meal (81.8%), but many also claimed they

would advise patients to use gastroprotective agents (61%), reduce the dose of NSAIDs (45.8%), switch to selective NSAIDs (45.3%), or use other painkillers (42.8%). In the other hand and for selective NSAIDs, the most frequent advice given was to take NSAIDs after a meal (68.6%), use gastro protective agents (55.1%), stop taking NSAIDs (40.7%), switch to other painkillers (40.7%), or reduce the dose of NSAIDs (39.8%).

Table 5. Community pharmacists'	advice concerning management of	f or protection against ADI	Rs
due to the use of NSAIDs			

Advice on management	No. of community pharmacists (%)		
	Always	sometimes	never
Dispensing of non-selective NSAIDs			
Taking NSAIDs after meal	193 (81.8)	33 (13.9)	10 (4.2)
Using with gastro protective agents	144 (61)	80(33.4)	12(5.1)
Switching to selective COX-2 NSAIDs	107 (45.3)	109 (46.2)	20(8.5)
Switching to other painkillers	101(42.8)	1140(46.6)	25 (10.6)
Dose reduction	108 (45.8)	111 (47)	17 (7.2)
Consult with physicians	88 (37.3)	115 (48.7)	33 (14)
Stop taking NSAIDs	88 (37.3)	124 (52.5)	24 (10.2)
Dispensing of selective COX-2 NSAIDs			
Taking NSAIDs after meal	162(68.6)	60(25.4)	14 (5.9)
Using with gastro protective agents	130 (55.1)	90 (38.1)	16 (6.8)
Switching to selective COX-2 NSAIDs	94 (39.8)	114 (48.3)	28 (11.9)
Switching to other painkillers	96(40.7)	117 (49.6)	23 (9.7)
Dose reduction	94 (39.8)	110 (46.6)	32 (13.6)
Consult with physicians	83 (35.2)	122 (51.7)	31(13.1)
Stop taking NSAIDs	96 (40.7)	112 (47.5)	28 (11.9)

Table 6.Factors associated with frequency of adverse drug reactions (ADR) information provisio
to patients taking non-selective NSAIDs.

Factor	NO. pharmacists	NO. pharmacists %	
Age			
20 - <30	163	69.1	0.097
30- 50	72		0.56
> 50	1	0.4	0.06
Education level			
Bachelor	121	51.3	0.08
Diploma	115	48.7	0.07
Experience (years)			
< 10	178	75.4	0.01
10-20	51	21.6	0.07
21-30	7	3	0.06
Working hours			
< 10	32	13.6	0.233
10-12	98	41.5	0.225
>12	106	44.9	0.012

Table 7. Factors associated with frequency of adverse drug reactions (ADR) information provisi	ion
to patients taking selective NSAIDs.	

Factor	No. pharmacist	%	<i>p</i> -value	
Age				
20 - < 30	163	69.1	0.07	
30 -50	72	30.5	0.31	
> 50	1	0.4	0.70	
Education level				
Bachelor	121	51.3	0.77	
Diploma	115	48.7	0.49	
Experience (years)				
< 10	178	75.4	0.08	
10-20	51	21.6	0.04	
21-30	7	3	0.006	
Working hours				
< 10	32	13.6	0.49	
10-12	98	41.5	0.05	
> 12	106	44.9	0.04	

Discussion

NSAIDs are one of the most widely prescribed drugs worldwide for the treatment or relief of symptoms of pain and inflammation. As well as, some NSAIDs can be purchased without prescription[12, 18-21].Therefore, extensive and long-term use of these agents has been frequently associated with risk of complications, that range from GI upsets to renal failure, particularly in elderly patients and those with chronic diseases [21-24].

Many studies have been conducted worldwide illustrated inadequate knowledge and attitude regarding the adverse effects of over-the-(OTC) medications, counter particularly NSAIDs, that need more advice and counseling regarding convenient management or prevention from community pharmacists [25-29] In addition, a previous study done on hospital pharmacists in Thailand revealed that providing verbal information and additional written information could raise patients' knowledge and awareness of their drugs[20, 27].

Community pharmacies are an important source of NSAIDS supply, so they play a key role in screening of drug-related problems,[16] identifying high-risk patients, and counseling and providing information to patients. These pharmacists- related interventions can promote the appropriate selection of NSAIDs and prevent their serious long-term problems[12, 24, 30].

A total of 236 out of 363 administered questionnaires were returned fully completed and met the inclusion criteria, giving a response rate of 65%. In the present study, the majority of respondents were males compared to females, as shown in Table 2. The same findings were seen in a previous study conducted in Saudi Arabia, which revealed that the majority of participants were males (95.5%) [83]. Nevertheless, these findings are incompatible to those obtained in a previous study carried out in Thailand [12] which showed that the majority of community pharmacists were females (65.4%).

This discrepancy may be attributed to differences in the traditions between Thailand and the region of this study, where female can't work in the community pharmacies. As well as, the number of graduates from males from pharmacy collages in Dhamar, was higher than the number of graduates from females. The mean age of pharmacist was (31.3 ± 11.7) and there was a preponderance of those belonged to the age group of less than 30 years (68.9%). These findings were agreeing with a previous study conducted in Saudi Arabia [31], which revealed that the majority of respondents were aged between 25 to 34 years. However, other study done in Thailand revealed that the average age of participants was 37.2 ± 11.42 .

Although, the current study are agreeing with the study done in Saudi Arabia[31]. Bachelor was the highest level of education for participants, Doctor of Pharmacy and Master of Science are not present in community pharmacies in Yemen. most of community pharmacists had less than 10 years of experience, which is disagreeing with two studies carried out in Saudi Arabia and Thailand, which illustrated that 71% and 57.9% of community pharmacists respectively had more than 5 years of experience in community pharmacies[12, 31]. Community pharmacists should be aware of the most risk factors while dispensing NSAIDs and able to screen and monitor patients with risks to reduce NSAIDs complications[32].

In the present study, community pharmacists had a range of knowledge on different classes of NSAIDs, where the majority of the participants (86.9%) recorded having proper knowledge about the NSAIDs, whereas 13.1% revealed that their knowledge about NSAIDs was bad. About 70.3% and 62% of community pharmacists revealed appropriate knowledge regarding nonselective and selective NSAIDs respectively, as summarized in Table 3. The risk factors for NSAIDs are well-define and apply to both selective and non-selective NSAIDs [33-36]. Community pharmacists should be aware of the need to both screen and monitor patients at highrisk and provide information, both of which can help to reduce NSAIDS complications, such as acute renal failure [32, 37-39].

Regarding risk factors screening, evaluation of questionnaire revealed that the majority of the community pharmacists indicated that this was performed always when dispensing NSAIDs, as summarized in Table 4. The community pharmacists who claimed to routinely screen patients for risk factors before supplying selective COX-2 NSAIDs, were slightly more than those did so for non-selective NSAIDs, as seen in Table 4. These results incompatible with those in two previous studies carried out in Saudi Arabia and Thailand [12, 31].

Although the majority of pharmacists claimed to screen patients for potential risk factors and provide patients with information about adverse drug effects (ADRs) of both classes of NSAIDs and how to their management, many pharmacists reported they did not do so for all patients, where approximately 41% and 36% of community pharmacists reported they did not ask questions relating to history of taking steroid drug as a risk factor for the use of non-selective and selective NSAIDs respectively, as seen in Table 4. On the contrary, other study revealed that 14.5% and 17% of pharmacists indicated they did not ask questions relating to history of taking steroid

drug as a risk factor for the use of non-selective and selective NSAIDs respectively[31].

In the present study, the main risk factors that community pharmacists discussed with patients for the use of non-selective NSAIDs were pregnancy/or breast-feeding, history of GI ulcer and bleeding, uncontrolled hypertension, and older age, as outlined in Table 4. These findings are disagreeing with those in study carried out in Saudi Arabia [31], which revealed that pregnancy/or breast-feeding, older age, history of GI ulcer and bleeding, and number, duration and high dose of NSAIDs were the major risk factors for using of non-selective NSAIDs. In addition, a previous study conducted in Thailand revealed that history of GI ulcer /or bleeding, number, duration and high dose of NSAIDs, and history of renal impairment were the key risk factors for the use of non-selective NSAIDs[12].

In the other hand, showed that pregnancy/or breast feeding, history of GI ulcer/or bleeding and uncontrolled hypertension were the major risk factors for selective NSAIDs, as outlined in Table 4. Another study done in Saudi Arabia [27], showed that pregnancy/or breast feeding, older age, and uncontrolled hypertension were the main risk factors for the use of selective NSAIDs. However, a previous study conducted in Thailand revealed that cardiovascular disease, history of GI ulcer/or bleeding and number, duration and high dose of NSAIDs, were the main risk factors for the use of selective NSAIDs [12].

Using of both classes of NSAIDs and duration of use would increase the risk of side of cardiovascular effects and bleeding complications. In the other hand, age is considered to be a significant risk factor for NSAIDs related GI complications, therefore, proper management interventions should be achieved in the elderly. Many studies were conducted in other areas of the world reported that patients should be screened for the existence of GI and cardiovascular side effects before using NSAIDs, and should undergo GI-prevention therapy when risk could be an issue[31].

In Europe, most of patients, who using NSAIDs with one or more risk factors for GI complications may be received poor prevention treatments [31, 40]. Receiving information about NSAIDs in any way other than from the qualified individual may result in inappropriate and nonspecific information. The material in the medication leaflets is not suitable for the public. Therefore, only a few individuals are capable to understand the leaflets 'content [28, 41, 42].

NSAIDs are often used for long term and in high doses, both of which can increase the risk of adverse drug effects [12]. As well as, since NSAIDs can be dispensed with or without prescription, multiple NSAIDS may be used, by patients who may not inform pharmacists about their medicines. All this make the health care providers, particularly, community pharmacists, as medication experts, vital source of important and accurate information, in which community pharmacists should enhance consciousness of NSAIDs risks between consumers, provide proper counseling and evaluate potential risk factors to assure safe and suitable use of these drugs [43,44].

For non-selective and selective NSAIDs, respectively 81.8% and 68.6% of community pharmacists claimed to advice the patients to use the drug after a meal for purpose of preventing of GI complications, as seen in Table 5. These finding similar to those in Saudi study, which showed that respectively 86.5% and 83.5% of pharmacists claimed to advice the patients to use the drug after a meal for purpose of preventing of GI complications [31]. A previous study in Thailand revealed that 83.3% of pharmacists claimed to advice the patients to use the drug after a meal for purpose of preventing of GI complications due to non-selective NSAIDs [12].

Slightly more than half of the pharmacists indicated that they regularly guide patients to use gastro protective agents for both non-selective and selective NSAIDs. and 46.6% and 49.6% of participants also claimed that they explain when to switching to other painkillers for both nonselective and selective NSAIDs, as outlined in Table 5. These results lower than those in another previous studies done in Saudi Arabia an Thailand[12, 31].

Table 6 & 7 revealed that pharmacists with less than 10 years' experience were significantly more likely to counsel their patients about ADRs related to users of non-selective. This finding also corresponds with significant association between years of experience and patient ADRs related to users of non-selective. In a similar manner, pharmacists who work more than 12 hours were significantly more likely to counsel their patients about ADRs related to users of nonselective and selective NSAIDs. However, there were no statistically significant differences for other factors such as age, education, which influenced the discussion of ADR linked to nonselective and selective COX-2 NSAIDs users.

Conclusions

Although the screening of risk factors, counseling and provision of information and management for patients using NSAIDs by community pharmacists, were high frequently than is the predictable, effective strategies are required from the health regulatory authorities to ensure that community pharmacy services in study area contribute in improving the dispensing practices, communication and awareness of risk factors for using NSAIDs, especially in high-risk patients who are taking NSAIDs. As well as, the medical education strategies should aim, not only to elevate the knowledge, but also to alter the behaviour and practices among under- and postgraduate students of pharmacy departments of medical sciences colleges to prevent potential medication -related problems.

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Hyperleucocytosis in patients with chronic leukaemia (Myeloid & Lymphoid type)

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Abstract

Chronic myeloid leukemia (CML) is a clonal disorder of hematopoietic stem cells. The disease arises as a consequence of a rare gene abnormality. Chronic lymphocytic leukemia is a neoplastic disease characterized by the accumulation of small mature-appearing lymphocytes in the blood, marrow, and lymphoid tissues. This study aimed to determine alteration in some of the basic haematological parameters in patients with chronic leukemia and to evaluate the hematological parameters in patients with chronic leukaemia who have laboratory evidence of hyperleucocytosis and those without. In this study, 134 patients were enrolled with newly diagnosed chronic Leukemia patient (Myeloid and Lymphoid) at Al-Gumhouri Teaching Hospital Sana'a and National oncology center Sana'a in the period of the study (From 18 August to 30 November 2009) and studied, (CBC) were done using automated blood cell analyzer, Blood film examination and Bone marrow examination.

Out of the total 134 patients studied, 108/134 (81%) were chronic myeloid leukaemia and 26/134 (19%) were chronic lymphocytic leukaemia.109/134 (81.3%) were more than 30 years old and

25/134 (18.7%) were less than 30 years old. In CML: 64 (59.3%) were males and 44 (40.7%) were females, with male: female (M:F ratio) of 1.5:1. In CLL: 18 (69.2%) were males and 8 (30.7%) were females, with male: female (M: F ratio) of 2.3:1.100/108 (92.6%) CML patients were anemic at diagnosis with a haemoglobin level ranging between 5.3 and 12.9 g/dl, Mild to Moderate anaemia found in the majority of the CML patients studied 95/108 (87.9%). 11/134 (8.2%) patient had normal haemoglobin level (12-14.6 g/dl). leucocytosis was present in all (100%) patients, of which 4/134 (3%) patients had WBC count ranging from 12 – 50 x 109/L. 24(18%) out of 134 patients had leucocytosis (more than $50\Box 109/L$). hyperleucocytosis with WBC count more than 100 x109/L found in 91/134 patient (68%) & those with hyperleucocytosis (WBC count more than 300 x109/L) found in 15/134 (11%). Anaemia present in 123/134(91.8%) patients with 100/108 (92.6%) CML type & 23/26 (88.5&) CLL type. 11/134

(8.2%) patient shows normal hemoglobin concentration. Thrombocytopenia found in 24/134 (17.9%) patient with 12/108 (11.1%) CML type & 12/26 (46%) CLL type. Thrombocytosis with platelet count more than 1000 found in 4/108 (3.7) CML patient only. A statistically significant difference in the total white blood cell count & platelet count (P = 0.02 & 0.01 respectively) follows the severity of anaemia (for hemoglobin concentration) noticed in CML patients. A statistically significance (P = 0.04) lower hemoglobin concentration in patients with hyperleucocytosis than those without. No statistically significant difference in the hematological parameters follows the severity of anaemia (for hemoglobin concentration) noticed in CLL patients. A statistically significant difference in the total white blood cell count follows the age of the chronic leukemia patients (P = 0.02).

Conclusion: Hyperleukocytosis occur more in CML than in CLL type of chronic leukemia and the laboratory evidence of hyperleukocytosis in chronic leukemia requires particular attention with special care in the diagnosis and treatment.

Keywords: CML, CLL, (CBC), Blood film examination and Bone marrow examination.

Introduction:

Chronic myeloid leukaemia (CML) is a potentially fatal stem cell neoplasia that constitutes nearly 14 % of all leukaemia. CML is caused by translocation of chromosome 9 and 22 called to create what is Philadelphia chromosome. This translocation remove a critically regulatory domain from tyrosin kinase (ABL) such that its protein product is constitutively active, this lead to uncontrolled cell growth and proliferation. The modified protein is known as BCR-ABL oncoprotein (1).

Laboratory tests are of great importance for this disease. The tests used for CML include complete blood cell count with platelet, cytogenetic analysis, fluorescence in situ hybridization (FISH), and polymerase chain reaction (PCR).

The hematological count are the least sensitive measure of the disease with a limit of detection of leukaemic burden of 1011 cells (cytogenetics can detect a burden of 109, PCR detect a burden as few as 105 leukaemic cells).

The chronic myelogenous leukemias include classical chronic myelogenous leukemia, chronic myelomonocytic leukemia, juvenile myelomonocytic leukemia, and chronic neutrophilic leukemia.

Classical chronic myelogenous leukemia presents with anemia, exaggerated granulocytosis, a large proportion of mature neutrophils, absolute basophilia, normal or elevated platelet counts, and frequently, splenomegaly (2).

The marrow is very hypercellular, and cytogenetic analysis will show a Ph chromosome in 90 percent of cases, and molecular diagnostic analysis will reveal a rearrangement of the BCR gene on chromosome 22 in 99 percent of cases.

Chronic lymphocytic leukemia is a neoplastic disease characterized by the accumulation of

small mature-appearing lymphocytes in the blood, marrow, and lymphoid tissues.

It is the most common adult leukemia in Western societies. Generally, the neoplastic lymphocytes are of the B-cell lineage. In less than 2 percent of cases, however, the neoplastic cells are of T-cell origin and are considered under the heading Tcell prolymphocytic leukemia.

Hyperleukocytosis in CML & CLL

About 15 percent of patients present with symptoms or signs referable to leukostasis as a result of the intravascular flow-impeding effects of white cell counts over 300×109 /liter (in the present study hyperleucocytosis in CML found in 14/108 (13%). The effects of total leukocyte counts from 300 to 800×109 /liter include impairment of the circulation of the lung, central nervous system, special sensory organs resulting in some combination of tachypnea, dyspnea, cyanosis, dizziness, slurred speech, visual blurring, diplopia, retinal vein distention, retinal hemorrhages, papilledema or impaired hearing. Such symptoms or signs usually respond to the rapid decrease in white cell count by a combination of leukapheresis and hydroxyurea therapy (3).

In CLL: Leukemic leukocytosis in excess of 800 \times 109/liter may produce blood hyperviscosity (in the present study hyperleucocytosis in CLL found in 1/26 (3.9%).

The aims of this study are:

1. To determine alteration in some of the basic haematological parameters in patients with chronic leukaemia.

2. To evaluate the hematological parameters in patients with chronic leukaemia who have laboratory evidence of hyperleucocytosis and those without.

Methods:

The study included all patients with Chronic Leukemia (Myeloid and Lymphoid) attended to Al- Gumhouri Teaching Hospital Sana'a and National oncology center Sana'a Yemen. In the period of the study (from 18 August to 30 November 2009).

Basic Hematological Parameters:

All the basic hematological tests (CBC) were done using automated blood cell analyzer with morphological study. Blood film examination (peripheral blood smear). Bone marrow examination.

Study design: Cross-Sectional Study.

Sample size: 134 participants.

Ethics issues:

The study was approved by the Human Research Ethics Committee (HREC) in Al-Gumhouri Teaching Hospital Sana'a and National oncology center Sana'a Yemen and from Faculty of Medicine and Health Sciences at Thamar University, Dhamar – Yemen.

Results:

In the present study, chronic leukaemia (CL) distribution shows CML type predominance compared to CLL, with CML to CLL ratio of 4.2:1, which agrees with the results of most workers. CML was the predominant type of CL in adults included in this study 108/134 (81%), this agrees with the universal observation about the predominance of CML in adults. the majority of our CML patients 83/108 (77%) were adults,

which agree with the universal concept about the predominance of CML in adults.

All the CLL patients studied were old age group, which agree with the universal concept about the predominance of CLL in this age group. Sex distribution of our CL patient's shows male to female ratio of 1.6:1, also our CML patients shows male: female ratio of 1.4:1 & CLL male to female ratio was 2.3:1, these results agrees with that found in other studies.

Table 1: Distribution of Chronic Leukaemia Patients studied According to the Type, Age and Gender.

ТҮРЕ	No. (%)	Age (yrs.)	No. (%)	Sex	No. (%)	M:F ratio				
		< 30 25 (23%)	Μ	15 (60%)	1 5.1					
CMI	108		25 (26 / 0)	F	10 (40%)	1.5.1				
CIVIL	(81%)	> 30	83 (77%)	Μ	49 (59%)	1 4.1				
		≥ 30	05 (7770)	F	34 (41%)	1.4.1				
		< 30 ≥ 30	0 (0%)	Μ	0 (0%)	0				
CLI	26 (109/)		0 (0 /0)	F	0 (0%)	U				
CLL	20 (1970)		> 30	> 30	> 30	> 30 2	26 (100%)	Μ	18 (69.2%)	2 3.1
			20 (100 /0)	F	8 (30.8%)	2.3.1				
Total 134 (100%)	134	< 30 25	25 (10 70/)	Μ	15 (60%)	1(1				
			25 (18.7%)	F	10 (40%)	1.0:1				
			M	67 (61.5%)						
	≥ 30 109 (81.3%)	F	42 (38.5%)	1.6:1						



Figure 1: Distribution of Chronic Myeloid Leukaemia According to Severity of Anaemia.

Mild to Moderate anaemia found in the majority of the CML patients studied 95/108 (87.9%), severe anaemia found in 5/108(4.6%).



Figure 2 Distribution of Chronic lymphoid Leukaemia According to Severity of Anaemia

Mild to Moderate anaemia found in the majority of the CLL patients studied 22/26 (85%), severe anaemia found in 1/26(3.9%).

PARAMETERS		CML	CLL	TOTAL
		NO. (%)	NO. (%)	NO. (%)
		108 (80.6%)	26 (19.4%)	134 (100 %)
nt	4 – 11	0 (0%)	0 (0%)	0 (0%)
coul	12 - 50	3 (2.8%)	1 (3.8%)	4 (3%)
WВС 10 ⁹ Л	51 - 100	17 (15.7%)	7 (26.9%)	24 (18%)
otal V (×	> 100	74 (68.5%)	17 (65.4%)	91 (68%)
To	> 300-653	14 (13%)	1 (3.9%)	15 (11%)
0 ⁹ /L)	Neutrophils	(87.8 ± 57.2) (44.8%)	(11 ± 17.7) (7.5%)	(72.9± 60.2) (39.2%)
unt (×1	Band form	(12.1 ± 18.4) (6.2%)	(0.2 ± 0.5) (0.1 %)	(9.8± 17.1) (5.3%)
WBC co	Myelocytes	(37.5 ± 34.8) (19.2%)	(0.06 ± 0.3) (0.04%)	(30.2± 34.6) (16.2%)
rential ¹	Blast cells	(6.8 ± 6.8) (3.4%)	(0.6 ± 1.1) (0.4%)	(5.6± 6.6) (3 %)
Diffe	lymphocytes	(20 ± 37.3)	(133 ± 81.8) (90.9%)	(41.9±66.2) (22.5%)

Table 2: Blood Cells Parameters (Total WBC Count and Differential WBC Count) in ChronicLeukemia

The total leukocyte count in CML is always elevated at the time of diagnosis and is nearly always over 25×109 /L; over two third of the CML patients have total white counts over 100 $\times 109$ /liter (88/108 (81.5%). Hyperleucocytosis (white counts over 300 \times 109/liter) was detected in 14 /108 (13%) CML patients & in 1/26 (3.9%) CLL patient. This agrees with almost all standard works in this field of study. The total absolute lymphocyte count is increased (mean 20×109 /liter) in patients with CML at the time of diagnosis as a result of the balanced increase in T-helper and T-suppressor cells.

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The diagnosis of CLL requires a sustained monoclonal lymphocytosis greater than 5 \times 109/liter, all the included cases in this study

shows this fact and in the present study the mean absolute lymphocyte count generally is 90.9×109 /liter.

PARAMETERS		CML	CLL	TOTAL	
		NO. (%)	NO. (%)	NO. (%)	
		108 (80.6%)	26 (19.4%)	134 (100 %)	
-	< 6	5 (4.6 %)	1 (3.9%)	6 (4.5 %)	
globir IL)	6-9	45 (41.6%)	10 (38.5%)	55 (41%)	
lemoş (g/c	> 9	50 (46.3%)	12 (46.1%)	62 (46.3%)	
—	normal	8 (7.4%)	3 (11.5%)	11 (8.2%)	
	<150	12 (11.1%)	12 (46%)	24 (17.9%)	
	150 - 450	43 (39.8%)			
Platelet count (×10 ⁹ /L)	451 - 800	40 (37.1%)	14 (54%)	106 (79.1%)	
	801-1000	9 (8.3%)			
	> 1000	4 (3.7%)	0 (0%)	4 (3.0%)	

Table 3: Blood Cells Parameters (Hemoglobin and Platelet count) in Chronic Leukemia

The platelet count is elevated in about 53/108 (49.5%) percent of CML patients at the time of diagnosis and is normal in most of the rest 43/108 (39.8%). The platelet count may increase during the course of the chronic phase 49/108 (45.3%); platelet counts over 1000 \times 109/liter are not

unusual 4 (3.7%) (Table: 3). This might reflects the proliferative feature of the thrombopoietic lineage as part of the myeloproliferative process in the CML type of the chronic myeloproliferative disorder (CMPD).

	HAEM(
PARAMETER	severe (Hb: < 6 g/dl) NO. (%) 5 (4.6%) (± SD.)	moderate (Hb: 6-9 g/dl) NO. (%) 45 (41.7%) (± SD.)	mild (Hb: >9 g/dl) NO. (%) 58 (53.7%) (± SD.)	P- value
Hemoglobin (g/dl)	(5.64±.024)	(7.7±0.89)	(10.95±1.2)	0.1
Total WBC count (×10 ⁹ /L)	(156.5±70.3)	(249.6±118.5)	(179.5±103.4)	0.02
Platelet count (×10 ⁹ /L)	(460.8±377.03)	(487.7±289.7)	(448.1±255.9)	0.01

Table 4: Relation between total WBC & platelet count and severity of anaemia in CML patients

A statistically significant differences detected in the total WBC & platelet count in relation to the hemolglobin level in CML patients studied. No similar difference found in CLL patients studied.

Table 5 Relation between total WBC & platele	t count and severity of anaemia in	CLL patients
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	HAEMO				
PARAMETER	(Hb: < 6 g/dl) NO. (%) 1 (3.8%) (± SD.)	(Hb: 6-9 g/dl) NO. (%) 10 (38.5%) (± SD.)	(Hb: >9 g/dl) NO. (%) 15 (57.7%) (± SD.)	P- value	
Hemoglobin (g/dl)	(4.1±0)	(7.14±0.98)	(11.44±1.6)	0.2	
Total WBC count (×10 ⁹ /L)	(237±0)	(162.04±120.4)	(144.9±73.5)	0.2	
Platelet count (×10 ⁹ /L)	(86±0)	(134.5±110.2)	(245.3±175.7)	0.2	

No statistically significant differences detected in the total WBC & platelet count in relation to the hemolglobin level CLL patients studied.

Table 6: Relationship between hyperleucocytosis and Hematological Parameters of Chronic MyeloidLeukaemia.

	HYPERLEUCOC (total WBC count: mo			
	Present	Absent	P- value	
PARAMETER	NO. (%)	NO. (%)	(t-test)	
	%14 (13	×94(87		
	± SD.	± SD.		
Hemoglobin (g/dl)	(8.45±1.8)	(9.5±2.08)	0.04	
9/Total WBC count (×10/L)	(406.6±123.2)	(178.01±76.9)	0.1	
Platelet count (×10 /L)	(353.07±345.3)	(481.9±259.9)	0.08	

A statistically lower hemoglobin level in CML patients with hyper-leucocytosis found in comparison with those without hyperleucocytosis. This agree with the finding of other worker.

Table 7: Relationship between WBC count and Age in Myeloid Leukaemia patients

WBC count Ac		
(<40 years)	P- value	
NO. (%) 55 (41.05%)	NO. (%) 79 (58 .95%)	(1-1051)
± SD.	± SD.	
(192.2±105.9)	(201.06±115.9)	0.02

A statistically significant higher WBC count in chronic leukaemia patients studied (Both myeloid & lymphoid) found in older patients (More than 40 years) than younger patients. This finding disagree with those of other studies and it

might attributes to the few cases of childhood CML cases included in the present study.

Discussion

Chronic myeloid leukaemia (CML) is a potentially fatal stem cell neoplasia that constitutes nearly 14 % of all leukaemia. CML is caused by translocation of chromosome 9 and 22 called create what is Philadelphia to chromosome. This translocation remove a critically regulatory domain from tyrosin kinase (ABL) such that its protein product is constitutively active, this lead to uncontrolled cell growth and proliferation. The modified protein is known as BCR-ABL oncoprotein (1).

Laboratory tests are of great importance for this disease. The tests used for CML include complete blood cell count with platelet, cytogenetic analysis, fluorescence in situ hybridization (FISH), and polymerase chain reaction (PCR).

The hematological count are the least sensitive measure of the disease with a limit of detection of leukaemic burden of 1011 cells (cytogenetics can detect a burden of 109, PCR detect a burden as few as 105 leukaemic cells) (1).

Hyperleukocytosis in CML & CLL

About 15 percent of patients present with symptoms or signs referable to leukostasis as a result of the intravascular flow-impeding effects of white cell counts over 300×109 /liter (in the

present study hyperleucocytosis in CML found in 7/104 (6.7%). The effects of total leukocyte counts from 300 to 800×109 /liter include impairment of the circulation of the lung, central nervous system, special sensory organs, and penis, resulting in some combination of tachypnea, dyspnea, cyanosis, dizziness, slurred speech, delirium, stupor, visual blurring, diplopia, retinal vein distention. retinal hemorrhages, papilledema, tinnitus or impaired hearing. Such symptoms or signs usually respond to the rapid decrease in white cell count by a combination of leukapheresis and hydroxyurea therapy (1 and 18 -20).

In CLL: Leukemic leukocytosis in excess of 800 \times 109/liter may produce blood hyperviscosity (in the present study hyperleucocytosis in CLL found in 1/24 (4.17%) (1, 22).

In the present study, chronic leukaemia (CL) distribution shows CML type predominance compared to CLL, with CML to CLL ratio of 3.3:1 (Table: 1), which agrees with the results of most workers(1 - 5).

CML was the predominant type of CL in adults included in this study (Table: 2) 80/104 (76.9%), this agrees with the universal observation about the predominance of CML in adults (1 - 5).

The majority of our CML patients 57/80 (71.25%) were adults (with>30 yrs.), (Table: 1) which agree with the universal concept about the predominance of CML in adults (1 - 5).

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All the CLL patients studied were old age group, which agree with the universal concept about the predominance of CLL in this age group (1 - 5).

Sex distribution of our CL patients shows male to female ratio of 1.7:1, also our CML patients shows male:female ratio of 1.4:1 (Table: 1) these results agrees with that found in other studies (1 - 6). & CLL male to female ratio was 5:1, (Table: 1).

Mild to Moderate anaemia found in the majority of the CML patients studied 95/108 (87.9%) (Fig. 1), severe anaemia found in 5/108(4.6%).

Mild to Moderate anaemia found in the majority of the CLL patients studied 19/24 (79.2%) (Fig. 2), severe anaemia found in 2/24(8.3%).

CML by definition involves a total WBC count more than 25×109 /liter .In the present study, the total leukocyte count in CML is always elevated at the time of diagnosis and is nearly always over 25×109 /L; over two third of the CML patients have total white counts over 100×109 /liter (55/80 (60.88%). Hyperleucocytosis (white counts over 300×109 /liter) was detected in 5 /80 (6.25%) CML patients & in 2/24 (8.3%) CLL patient. This agrees with almost all standard works in this field of study.

The total WBC count in the majority of CL patients studied (73/80(91.25%) CML cases / 22/24 CLL (91.7%) cases) were more than 50 to $653\Box 109/L$, this rang agree with the finding of another worker (7).

There is a marked granulocytosis including all stages of granulocytic maturation, from blasts to segmented neutrophils. There is a predominance of more mature forms, from myelocytes to segmented neutrophils. in the present study, Myeloblasts are only 4.7% of WBCs (Figure 4) myelocytes are 18.3% and bands account for 4.7 percent; and segmented neutrophils account for 44.2 percent of total leukocytes (Figure 4).The distribution of the differential cell count in CML patients studied shows a bi-peak distribution of the white cells at the neutrophil and myelocytes stages, this findings agree with the globally accepted classical findings in the typical/classical type of CML (Figure: 4) (1).

The total absolute lymphocyte count is increased (mean about 20×109 /liter) in patients with CML at the time of diagnosis as a result of the balanced increase in T-helper and T-suppressor cells (1).

The platelet count is elevated in about 53/108 (49.5%) percent of CML patients at the time of diagnosis and is normal in most of the rest 43/108 (39.8%). The platelet count may increase during the course of the chronic phase 49/108 (45.3%); platelet counts over 1000×109 /liter are not unusual 4 (3.7%) (Table: 2). This might reflects the proliferative feature of the thrombopoietic lineage as part of the myeloproliferative process the CML of the chronic in type myeloproliferative disorder (CMPD) (11-16).

A statistically significant differences detected in the total WBC & platelet count in relation to the

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hemolglobin level in CML patients studied (Table:3). No similar difference found in CLL patients studied (Table: 5).

A statistically lower hemoglobin level in CML patients with hyper-leucocytosis found in comparison with those without hyperleucocytosis (Table: 4). This agree with the finding of other worker (8).

A statistically significant higher WBC count in chronic leukaemia patients studied (Both myeloid & lymphoid) found in older patients (More than 40 years) than younger patients (Table:6). This finding disagree with those of other studies (9, 10) and it might attributes to the few cases of childhood CML cases included in the present study.

The diagnosis of CLL requires a sustained monoclonal lymphocytosis greater than 5 \times 109/liter, all the included cases in this study shows this fact and in the present study the mean absolute lymphocyte count generally is 90.9 \times 109/liter.

Mild anemia $(12/26 \ (46.1\%))$ and/or thrombocytopenia $(12/26 \ (46\%))$ are common at diagnosis in this study, but significant decreases (hemoglobin <6 g/dL found in 1/26 (3.9%)) (figure: 2).

Thrombocytopenia detected in 12/26 (46%) CLL cases studied, this thrombocytopenia might attributes to marrow replacement/infiltration and / or hypersplenism.

Conclusions:

1. Hyperleucocytosis occur more in CML than in CLL type of chronic leukaemia.

2. Laboratory evidence of hyperleucocytosis in chronic leukaemia requires particular attention with special care in the diagnosis and treatment.

3. Hyperleucocytosis in chronic leukaemia is associated with lower hemoglobin concentration compared to patients without hyperleucocytosis.

Recommendations

1. The availability of well-equipped laboratory supplied with recent highly sensitive methods enable detection of hyperleucocytic leukaemia at an early stage. This is fundamental for the proper management of chronic leukaemia patients.

2. Monitoring of the blood viscosity in patients with hyperleucocytic chronic leukaemia are recommended with particular attention to blood transfusion during initiation of therapy to prevent leukostasis and the fatal sequences.

3. Establishment of medical documentation and registry unit for patient with leukaemia is fundamental with particular attention to the laboratory data reporting in an accomplished manner.

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Assessment the effects of radiation on the hematological parameters among medical imaging technologists in Dhamar city hospital, Yemen

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Assessment the effects of radiation on the hematological parameters among medical imaging technologists in Dhamar city hospital, Yemen

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Abstract

Background: Long-term exposure to low doses of ionizing radiation adversely affect human cells and tissues of medical imaging technologists, especially hematological parameters.

Aim: The aim of the present study to assess the effect of low dose radiation on the hematological parameters among MITs of Dhamar City Hospitals, Yemen.

Method: A cases-control study with 100 participants in the period two months (from 1- March to 30 April 2021) of Dhamar City was carried out. Out of them 60 were radiation exposed and 40 were controls. Hematological parameters were analyzed using Sysmex XN-350. Data was entered and analyzed using SPSS version 25 P. values ≤ 0.05 were considered statistically significant.

Results: In this study the Monocyte, Basophil, RBCs, HGB, HCT and RDW-SD were higher while MCHC and RDW-CV were lower in the exposed group. Significantly increased blood parameters (RBCs, HGB, HCT and lymphocyte) were statically

increased significant among both exposure groups work less or equal six years and work more than six years compared to control group. Also, Neutrophil show statically decrease significant (P<0.05) with exposure group who work more than six years.

Conclusion: Low dose of ionizing radiations can alter CBC parameters of radiation technician medical imaging technologists. Effect of radiation increased with long term of exposure.



We recommended using appropriate personal protective measures for medical imaging technologists. Furthermore, performing a research order to have a clearer image of the effects of ionizing radiation.

Keywords: Low dose radiation, hematological parameters, medical technologists, Dhamar City, Yemen.

Introduction:

Radiation is energy in the form of waves or stream of particles. It can come from unstable atoms or it can be produced by machines, travels from its source in the form of energy waves or energized particles (1). Radiation may be classified as ionizing or non-ionizing, depending on its ability to ionize matter (2). Exposure to ionizing radiation (IR) is inherent in daily life and the average worldwide exposure from all sources approximately ~3 Millisievert (mSv)/year. Natural background radiation exposure contributes to ~2.4 mSv/year, (3). Medical imaging and the largest man made source of exposure and contributes to ~0.6 mSv/year. Diagnostic imaging and have substantially improved health care services and patient outcomes over the years (4).

IR are widely used in the diagnosis and treatment of patients. Radiation workers have the direct responsibility of performing the tests in the radiology, computed tomography (CT), nuclear medicine, and radiotherapy departments since they are frequently exposed to radiation (5 & 6). Hematopoietic cells (HPCs) considered the most sensitive cells to radiation therefore IR exposure directly damages HPCs and alters the capacity of bone marrow stromal elements to support and/or maintain hematopoiesis in vivo and in vitro.

Exposure to IR induces dose-dependent declines in circulating hematopoietic cells not only through reduced bone marrow production, but also by redistribution and apoptosis of mature formed elements of the blood (7 & 8). Generally, exposure to IR including X-rays and gamma rays will lead to abnormal hematological findings, cancer including leukemia, birth defects in the future children of exposed parents, and cataracts. This risk associated with each imaging procedure is extremely low but, does slowly increase with the increasing number of exposure medical imaging techniques. Accordingly, blood cell count can be used as a biological indicator in the investigation of the damage caused by radiation (9). Diagnostic X-rays are the largest man-made sources of radiation exposure to the general population, contributing about 14% of the total annual exposure worldwide from all sources. Although diagnostic X-rays provide great benefits, their use involves some small risk of developing cancer is generally accepted (10 & 11).

Because application of IR increases continuously in medicine therefore the number of diagnostic technicians also increases. Diagnostic technicians (DT) may expose chronically to low doses of Xray during their work especially those whom they do not use radiation protection tools. Some studies have demonstrated the negative effect of LDR on hematological parameters while others detect the change at genetic analysis level only. No published study is available from our country. Thus, this study has recruited X-ray technicians as they are continuously exposed to occupational IR typically X-ray.

Therefor this study to assess the effect of low dose radiation (LDR) on the hematological parameters of medical imaging technologists (MITs) of Dhamar City Hospitals.

Materials and Methods

Study design

A cases – control study was conducted to assess effects in the hematological profile of MITs in Dhamar City Hospitals, Yemen.

Study area

The study was conducted on MITs, the samples collected within two months of Dhamar City hospitals and its suburbs from 1-March to 30 April 2021.

Study population

MITs Dhamar City Hospitals who voluntarily participated in the study and sign for consent. Healthy controls, with the same range of age, sex, and area residence with the exposed workers were taken.

Inclusion and exclusion criteria

Inclusion criteria

All apparently healthy workers with work experience of one year (1year) and above were included.

Exclusion criteria

Participants, both exposed and unexposed, with gross anemia, known history of diabetes mellitus, cardiopulmonary disease, acute or chronic infection, autoimmune disease, malignancy, those who have taken radiotherapy or chemotherapy and those who are taking any drug during the study period were all excluded.

Sample size determination

Sample size was determined by taking all MITs of Dhamar City Hospitals available through the data collection period who are fulfilling the explained criteria and who are volunteers to participate by giving their informed consent. In this study 100 participants were recruited. A total of 60 apparently healthy occupational radiation exposed workers and a total of 40 apparently healthy and unexposed controls were included.

Data collection procedure

Details of the socio-demographic background, occupational and medical history regarding workrelated exposure to mutagenic agents, safety measures taken, duration of exposure, use of therapeutic drugs and smoking was obtained from a questionnaire that was completed by each study participant. The information was used to include or exclude participants.

Sample Collection and Processing

About 3 ml of venous blood was collected from volunteer participants, who have fulfilled the

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criteria, into lavender Ethylene diamine tetracetic acid (EDTA) tube for complete blood count and blood cell morphology tests. In this collection process a 23-gauge needle was used in order to avoid clotting or hemolysis. For proper mixture of blood and anticoagulant, collected specimen was mixed by inverting the tubes 8-10 times. Each specimen was checked for the presence of clots prior to labeling and analysis. Standard venous blood collection procedure was followed to ensure the quality of specimen. CBC was performed within to one hour of collection (12).

Data analysis

Data was analyzed using SPSS Version 25. To conduct analysis, Quantitative variables were expressed Percentage as well as Mean ± standard deviation (SD), Independent t-test used to comparison hematological parameters of MITs and control. Chi-squire used to show percentage of hematological parameters among MITs and control. One-way ANOVA was used to Comparison of hematological parameters among exposed groups and unexposed groups depend on duration of work in medical imaging. P. value of <0.05 was regarded as significant.

Ethical Consideration

Approval for this study was taken from the department of chemistry of applied science

collage in Thamar University. Informed consent was obtained from the study subjects before data collection and blood sampling were carried out. Study participants were told that they have the right to quit the study any time they decided and that data is confidential and it will be used only for the study.

Results and Discussion

Exposure of cells to IR induces damage in various cellular compartments and results in complex biological responses (13). It has been described that blood cell counts immediately drop soon after irradiation with low doses of IR (14).

This study has analyzed blood samples of the exposed workers for CBC and compared it with controls.

Demographic characteristic distribution

Results showed that sixty 60 healthy medical radiation workers were precipitate in this study. Their age ranged from 20 to 60 years the mean of age was 28 years. The result reveal that mean of duration of work experience was 6 years, mean of work per day 10 hours. Medical radiation workers were control to forty 40 healthy non-radiation exposure.

Table 1: Demographic characteristic distribution.

Demographic characteristic	Medical Radiation Workers group		
	n=60 (100%)		
Age			
≤28	38 (63.3%)		
>28	22 (36.7%)		
Duration of work			
≤ 6 years	35 (58.3%)		
>6 years	25 (41.7%)		
Work per day			
≤ 10hours	38 (63.3%)		
>10 hours	22 (36.7%)		

Hematological parameters analysis among MITs and control group

Table 2 revealed that a number of the CBCparameters are affected in the radiation exposedworkers as compared to workers who were notexposed to radiation.

Blood parameters (Monocyte, Basophil, RBCs, HGB, HCT and RDW- SD) were statically increased significant (P<0.05), while (MCHC and RDW-CV) were statically decrease significant (P<0.05) between Control Group compared to Exposure Group, Whereas other blood parameters WBC, Neutrophil, Eosinophil, Lymphocyte, MCV, MCH and Plts) show difference in mean compared to control but this difference have no statically significant (P < 0.05).

Increased significant of Monocyte and RBCs agreed with findings by Surniyantoro *et al.*, 2019(15), in Indonesia which reported that RBCs

and monocyte counts were significantly higher in radiation-exposed workers compared to controls. Significant of RBCs, Monocyte and MCHC smellier to finding by Joudoh *et al.*, 2018 (16). In Iraq Significant differences were noted in hematological parameters in RBCs. Highly significant differences were noted in Monocyte and MCHC. Our study finding approved with study by Shahid *et al.*, 2015 (17). in Pakistan which noted Significant differences were found HGB, WBCs, MCH, MCHC, HCT, and Lymphocyte by the t-test between radiation exposed and unexposed individuals.

Our study show disagrees finding to several recent studies conducted in Iran, Iraq and Egypt which reported some variations in the basic hematological parameters with no statistically significant (18 - 20).

	Control Group n=40	Exposure Group n=60	
Parameters	Mean± SD	Mean± SD	P Value
WBCs	6.02±1.5	6.04±1.6	0.971
Neutrophil	3.2±1.4	2.8±1.2	0.086
Eosinophil	0.24±0.23	0.22±0.20	0.808
Basophil	0.02±0.02	0.04±0.02	0.003
Lymphocyte	2.2±0.7	2.247±0.63	0.079
Monocyte	0.34 ± 0.2	0.49 ± 0.12	0.000
RBCs	5.2 ± 0.58	5.7 ± 0.61	0.000
HBG	14.8 ±1.6	15.8±2.00	0.019
Plts	262 ±62	287 ±68	0.057
HCV	44.2 ±4.8	46 ±4.8	0.036
MCV	83 ±12	80 ±13	0.218
МСН	28±2	28 ±3.14	0.257
МСНС	76.5 ±11	33.7 ± 4	0.002
RDW-SD	41.7 ±9	51.5 ±61.8	0.039
RDW-CV	14.8 ±6.3	13.6 ±3.7	0.000

Table2:	Hematological	parameters of	MITs compared	with the control	group using	independent t- test:
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The frequency and percentage of Hematological parameters abnormalities among MITs compared with the control group as seen in table 3. The current study showed the higher prevalence of Hematological parameters (Neutrophil, Eosinophil, Basophil, Monocyte, RBCs, HGB and Plts) abnormalities among MITs compared with the control group.

The result show that 16 (26.7%) of MITs had abnormalities value of Neutrophil compared to control 5 (11.9%). Although Monocyte was higher abnormality among MITs 15 (25.3%), control showed 5 (11.9%). The result reveal that RBCs reach highest abnormalities among DT 23 (38.3%) compared to control 6 (14.3%). The results of the present work revealed that hematological parameters abnormalities had been more altered among MITs compared with a non-workers control group. This may be due to Long-term exposure to low doses of IR may adversely affect human cells and tissues of hospital radiation workers, especially in peripheral blood cells count (21). The possible reason higher prevalence increased among MITs exposure of their erythropoietin system during maturation of erythrocytes in the circulation (22). The present results also showed a decrease in

neutrophil values among MITs compared with control group as well as an elevation of both lymphocytes and monocytes among MR workers compared with control group. This result is in agreement with Joudoh *et al.*, 2018 (23). Who found decrease in neutrophil values among MITs compared with non-workers as well as an elevation of both lymphocytes and monocytes among workers compared with nonworkers control group.

Table 3: Prevalence of hematological parameters abnormalities among MITs and control groupusing Chai-squire test

HPS	Control Group	Exposure Group
WBCs	4 (9.5%)	3 (5%)↓
Neutrophil*	5 (11.9%)	16 (26.7%) 🗸
Eosinophil	6 (14.3%)	8 (13.3%) 个
Basophil	2 (4.8%)	7 (11.7%)个
Lymphocyte	7 (16.3%)	7 (11.7%)↑
Monocyte	5 (11.9%)	15 (25.3%) 个
RBCs*	6 (14.3%)	23 (38.3%) 个
HBG	2 (4.8%)	7 (11.7%) 个
Plts	4 (9.5%)	9 (15%)个

The arrow \downarrow mean that value was under normal rang, while \uparrow arrow mean that value was higher than normal rang.

Complete Blood Count values according to duration of working

Our study finding in figure.1 Show that the RBCs, HGB, HCT and lymphocyte were statically increased significant (P<0.05) between control group and both exposure groups, Also neutrophil show statically decrease significant.



Figure 1: Mean Complete Blood Count values of medical imaging technologists according to duration of working, compared with their controls groups.



Figure 2: Mean Complete Blood Count values of medical imaging technologists according to duration of working, compared with their controls groups and significance level using ANOVA test:

However the significantly increased of blood meters in our study result were approved in some parameters differ in the parameters to recent study conducted in Iraq done by (24) studied the effects of occupational exposure of x-Ray on hematological parameters of DT .Which observed that the lymphocytes, RBCs, HGB and HCT significantly (P<0.05) increased.

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In another study done by Meo S. A. (25), showed the reduction of mean value of Plts in X-ray technicians but he observed no significant difference in RBCs and WBCs with the control groups. However, recent studies conducted in Poland and Pakistan, Sudan, Sudia Arabia Kingdom found statistically significant difference between exposed and non-exposed subjects regarding to lymphocytes count (26).

Nureddin et al. conducted a study in Tripoli in 2016; they reported that the duration of exposure had a positive correlation with changes of exposed workers blood cells (27). Similarly, Shafiee *et al.* (2016) found a significant relationship, which increases the duration of X-ray exposure leads to increase the its effect of RBCs (28).

In this study we observed most of the CBC parameters in X-ray technicians were altered compared with the controls, this alteration may be due to overexposure of the technicians to low dose during their daily work since they do not use any radiation protection tools and not have personal dosimeters to record the absorbed energy. The majority of the technicians have not enough information about risk of low dose of Xray using in the machines (29).

Complete Blood Count (CBC) according to age of working.

Our study finding in fig 3 showed that RBCs, HBG, HCT and Lymphocytes were statically increased significant (P<0.05) between control group and both of age exposure groups, While Lymphocyte increased significantly (P<0.05) with exposure group who work less or equal 28 years.

However Our study finding in fig..4 revealed WBC. that the Neutrophil, Monocyte, Eosinophil, Basophil, MCV, MCH, RDW-SD, RDW-CV and Plts in MIT showed difference in mean compared with control but this difference have no statically significant (P > 0.05). Our finding similar with another study reported by Younis et al., noted positive relationship between age with MCHC counts (30). Another study was conducted by Sabagh and Chaparian, 2019 (31), showed that the number of RBCs, HGB, and HCT had a positive poor correlation with age (P<0.01).



Figure 3: Mean Complete Blood Count (CBC) values of medical imaging technologists according to age. *Mean there is statically significant at (P<0.05), compared controls groups.



Figure 4: Mean Complete Blood Count values of medical imaging technologists according to age. *Mean there is statically significant at (P<0.05), compared controls groups.

Conclusions

Depending on our results, we can conclude that low X-ray doses use for diagnosis from x-ray machine has an effect on the CBC parameters of medical imaging technologists. RBCs, HBG, Monocyte, Basophil, HCT and RDW-SD, MCHC and RDW-CV were significant difference between exposed and non-exposed groups. That is, the mean Monocyte, Basophil, RBCs, HBG, HCT and RDW-SD were higher while MCHC and RDW-CV were lower in the exposed group.

We recorded the CBC parameters (Neutrophil, Eosinophil, Basophil, Monocyte, RBCs, HBG and Plts) higher abnormal value out of normal range among medical imaging technologists compared to control group.

Significantly increased blood parameters (RBCs, HBG, HCT and lymphocyte were statically increased significant among both exposure groups work less or equal six years and work more than six years compared to control group., Neutrophil show statically decrease significant (P<0.05) with exposure group who work more than six years.

Training and courses about hazard of IR should be organized to enhance the healthcare quality of the technicians and to improve their knowledge about benefit of radiation protection tools such as lead apparel, lead goggles, thyroid shield etc. to protect themselves from any overexposure during the daily life.

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Intestinal parasitic infection among students of special needs centers in Dhamar Governorate.

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Intestinal Parasitic Infection among Students of Special Needs Centers in Dhamar Governorate

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Abstract

Background: Intestinal parasitic infections are still common in low-income countries, particularly in children due to low-quality drinking water, poor personal and environmental sanitation. This study aimed to diagnose, prevent and control intestinal parasites for people with special needs in Dhamar Governorate.

Method: Stool samples collected from 232 students aged between 1 and 18 old; 143 were males and 89 females. Data collected via pretested standard questionnaire. Fecal samples were processed and examined using a wet mount preparation after standing concentration technique.

Results: The overall prevalence of intestinal parasitic infection was 83.6 %. E. histolytica (76.7 %), G. lamblia (8.6 %), A.lumbricoides (0.4 %), H. nana (6.5 %), S. mansoni (0.4 %), Ent. Vermicularis (6.5 %), S. stercoralis (2.2 %).

Conclusions: The most common intestinal parasitic infection in children was E. histolytica). Method of transmission and protection among special needs students are limited

Keywords: Special needs, parasitic infection, Dhamar.

Introduction: Parasites are defined as organisms that get food and shelter from other organisms or the host and often harm it. For a parasitic to be outlined as intestinal, it must have an intestinal life cycle stage. Additionally, it may have a life cycle stage in the heart, circulation,

lung, tissue, and other animals on the surrounding (Ali, 2016). The intestinal parasitic infections in developing countries are considered the main cause of public health problems (Savioli et al., 1992). The recent studies revealed that around 30% of the total population in the world is infected with intestinal parasite (Keiser and Utzinger, 2010).The prevalence of intestinal parasitic infections in considerably varied in the different regions of the world. It depends on many factors such as and socioeconomic geographical factors. relatively humid areas, poverty, malnutrition, personal and community hygiene, high population density, unavailability of potable water and low health status, and poor sanitary facilities these factors give the optimum conditions for the growth and transmission and increase the probability of exposure to intestinal parasites (Brooker et al., 2009).

Also the distribution of such infections is influenced by other several factors such as suitable climatic conditions, environmental sanitation and human activities including population movements as well as poor sanitation. Intestinal parasitic infection can be transmitted throughout the year in temperate regions. The major tracks for transmission of intestinal parasites are the contamination of food or water or personal contact via fecal-oral route (Raza and Sami, 2009, Amer et al., 2016). Soiltransmitted helminths (STHs) infections caused by Ascaris lumbricoides, Trichuris trichiura and hookworms usually prevail in areas

Study area

The study will be conducted the special needs in Dhammar Governorate. Two hundred thirty-two (232) samples were collected from students at the district school Al- Bardouni, Al- Zubairi, Al-Amal and Al-Salah school.

Methods

A) Sample collection

1- Two hundred thirty-two (232) were collected from students.

2- Collect sample of stool on a wide-clean container.

B) Labeled number of sample on the container then asked all student selected with some questions to our study.

C) Laboratory examination of sample.

Concentration Technique (-Sedimentation Technique)

Standing method:

Approximately 1 g of feces are emulsified in
 times their volume physiological saline.

2- Emulsify is allowed to stand in a conical flask for 20-30 minutes.

3- Tow layers are formed. Top layer consists is a clear layer of saline and the other is the sediment and the saline is removed from the tube.

4- With a pipette take a sample of sediment & examination microscopically at low and high dry magnifications lens (10X) & (40X).

Sample size determination

Sample size was determined by taking Two hundred thirty-two (232) samples from students at the district school Al- Bardouni, Al- Zubairi, Al-Amal and Al-Salah school randomly who are fulfilling the explained criteria and who are volunteers to participate by giving their informed consent.

Data analysis

Data was analyzed using SPSS Version 25. To conduct analysis, Quantitative variables were expressed Percentage as well as Mean \pm standard deviation (SD),

Ethical Consideration

Approval for this study was taken from the ethic committee in Faculty of Medical Sciences at Al-Saeeda University.

Results

In this study, a total of 232 students with special needs were included in Dhamar City School, of whom 143 were males and 89 were females.

Table1: Frequency of Gender among students of special needs:

Gender	Frequency	Percent %
Μ	143	61.4
F	89	38.2
Total	232	100

The study showed that the percentage of Intestinal parasites were highest in male (61.4%) while the female was the lowest percentage (38.2 %).

Table 2: Frequency of age among students of special needs.

Age	Frequency	Percent%
3-9	67	28.8
10-13	114	48.9
14-18	51	21.9
total	232	100

The study showed that the percentage of Intestinal parasites were highest in age groups **10-13** years (48.9%) and then in age group **3-9** years (28.8%) while the age group **14-18** years was the lowest percentage (21.9%).

Table 3: Frequency of water among students of special needs

Source of water	Frequency	Percent
Main source	194	83.6
External source	38	16.4
Total	232	100

The study showed that the highest using of source of water was the main source where the percentage was (83.6 %) and then the external source (16.4 %).

Table 4: Frequency of water sources that used by students with special needs

Source of food	Frequency	Percent
At home	231	99.1
At restaurant	1	0.4
Total	232	100%

The study showed that the main source of food was the home where the percentage was (99.1%).

Table 5: Prevalence of Inter	stinal parasites among st	tudent of special needs	according to age
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	Age yrs.		Total
3-9	Positive	58	(7
		86.6 %	07
	Negative	9	100.0/
		13.4 %	100 %
10-13	Positive	94	
		82.5 %	114
	Negative	20	
		17.5 %	100 %
14-18	Positive	42	
		82.4 %	51
	Negative	9	
		17.6 %	100 %

Gender			
			Total
M	Positive	116 84.1 %	138
N= 138	Negative	22 15.9 %	100 %
F	Positive	78 83 %	94
N= 94	Negative	16 17 %	100 %

Cable 6: Prevalence of Intest	nal parasites among s	students of special n	eeds according to gender
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Table 7: Prevalence of Intestinal parasites among students of special needs according to Water in the school

Water in the school	Positive	Negative	Total
Main Source	103	20	123
N=123	83.7 %	16.3 %	100 %
External Source	91	18	109
N=109	83.5 %	16.5 %	100 %

Table 8: Prevalence of Intestinal parasites among students of special needs according to Sourceof food

Source of food	Positive	Negative	Total
At home	193	38	231
N=231	83.5 %	16.5 %	100 %
At restaurant	1	0	1
N=1	100 %	00 %	100 %

Consistency	Positive	Negative	Total
Diarrhea	9	2	179
N= 11	81.8 %	18.2 %	100 %
Soft	45	11	56
N= 56	80.4 %	19.6 %	100 %
Formed	77	12	89
N= 89	86.5 %	13.5 %	100 %
Semi solid	63	13	76
N= 76	82.9 %	17.1 %	100 %

Table 9: Prevalence of Intestinal parasites among students of special needs according to consistency

Table 10: Percentage of Intestinal parasites among student of special needs

Parasite	Positive	Negative	Percentage %
E. histolytica	178	54	76.7
G. lamblia	20	212	8.6
A.lumbricoides	1	231	0.4
H. nana	15	217	6.5
S. mansoni	1	231	0.4
Ent.Vermicularis	15	217	6.5
S. stercoralis	5	227	2.2

52=

Discussion

In the present study, the parasites were G. lamblia, E. histolytica, A.lumbricoides, H. nana, S. mansoni, Ent. Vermicularis, S. stercoralis. Among 232 persons (age 3-18 years) examined, 194 were found infected with intestinal parasites (83.6%) and 38 were negative (16.4%). infection was in male The highest percentage of parasites (61.4%). and this results is similar to other studies which showed greater in male (Azazy and Al-Tiar, 1999). Findings from our study demonstrated that the prevalence of E. histolytica infection (76.7%) was higher than other infection parasites, but previous study reported among children from Al-Mahweet (64.0%) and Ibb (33.7%) (Alsubaie et al., 2016, Alwabr and Al-Moayed, 2016). And G. lamblia in our study (8.6%). among children in the past study from Ibb was (23.6%), Hadhramout (16.8%) and Sana'a (16.1%)(Al-Haddad and Baswaid, 2010, Alsubaie et al., 2016, Al-Mekhlafi et al., 2016). In the present study, S. mansoni and A.lumbricoides was (0.4%), and in other study S. mansoni was (1.1%) and in Thailand A. lumbricoides was (1.3%) (Azazy and Al-Tiar, 1999, Wongsaroj et al., 2014, Farag, 1985, Boonjaraspinyo et al., 2013). In our study was (2.2%) for S. stercoralis and (6.5%) for Ent. Vermicularis and H. nana.

but reported by several authors S. stercoralis with a prevalence rate of (5.0%), Ent. Vermicularis (2.8 %) and H. nana (12.2%) (Azazy and Al-Tiar, 1999, Kitvatanachai and Rhongbutsri, 2017, Al-Haddad and Baswaid, 2010, Alsubaie et al., 2016).

The overall parasitic prevalence varied from one country to another all over the world. In Yemen it was 36.99% in Hadhramout (7), (27.5%) in Sana'a (4,8), In Oman, prevalence was 38.7% (Patel and Khandekar, 2006), it reached 70% in Kassala town, Sudan (Mamoun et al., 2009), and in the actual study(76.7%).This variety may be due to different climate in these different regions and/or to the number of samples tested and techniques used.

Conclusions

The most common intestinal parasitic infection in children was E. histolytica). Method of transmission and protection among special needs students are limited

Recommendations

 Further studies should include other cities in Yemen. For that, surveillance is required for intestinal parasites infection in special needs centers.

- Water and cleaning materials must be available in the toilets of special needs students schools
- 3. Teaching and counseling students about methods of transmition of intestinal parasites and how to prevent them.

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