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IMPACT OF NEWLY DESIGNED, CULTURALLY SENSITIVE PHARMACEUTICAL PICROGRAMS ON MEDICATION INFORMATION AND USE: SUDAN STUDY

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ABSTRACT

Background: Patients taking medicines need sufficient information to help them understand their potential harms and benefits. Healthcare providers mostly use the verbal form of medication information, which is easily forgotten and poorly understood. Written medication information displayed in medicines outer-packs and package inserts is difficult to be understood by patients. Visual form (pictograms), with verbal and written forms are prove to be very effective, easily understandable and highly acceptable by patients. **Objective:** To design, develop and test a set of twenty six (26) Sudanese culturally appropriate pharmaceutical pictograms, and assess their effectiveness in improving patients' use of medicines, based on their knowledge, perception and opinion. **Materials and Method:** This is a cross-sectional observational and questionnaire based interview was carried out in out- patient clinics at public hospital in central of Khartoum North (Bahri). A total 385 participants of age above 18 years old were enrolled. The data were analyzed by Chi-Square Test using SPSS version 21. **Result**: Most of the pharmaceutical pictograms were well understood and correctly interpreted. The average result percentage for the top twenty best understood pictograms was very high (92.6%). The result showed a significant correlation between participants perception and age (p value = 0.03). Study results showed a significant association between participants' level of education and correct interpretation (p=.004). **Conclusion**: Most of the designed and tested pharmaceutical pictograms were well

understood and correctly interpreted by participants Pharmaceutical pictograms were found to contribute positively to both understanding of medications and medicines use instructions.

KEYWORDS: Khartoum, Sudan, medication information, culturally sensitive, pictograms.

INTRODUCTION

Successful medication therapy depends not only on taking the appropriate medications, but also on taking them in the appropriate and safe manner, as prescribed, or advised by the health care provider (HCP).[1] Accordingly, if the treatment is to succeed and meet its desired health outcomes, patients need to be provided with sufficient, comprehensive, up-to-date, clear, understandable, and balanced medication information, that fits the patients' individual needs.[2] Communication between the patients and healthcare providers was reported to be deficient, unbalanced, ineffective and poorly useful to patients, possibly because it is not individualized.[3-6]

Patients usually, and mostly get their needed medication information from their health care providers (HCPs), mainly the physicians, pharmacists and nursing staff, in the verbal (oral), written, and/or visual forms.

The verbal medication information patients get from their health care providers is reported to be difficult to understand, and is easily forgotten.[7-9]

{Only 14% of the verbal information provided to patients would be remembered correctly.[10]

That poor patients' recall of the provided medication information were referred to three main reasons:-

- Providers use of difficult medical terminology (jargon),
- the mode or form in which information is provided (whether spoken, written or both),
- Factors related to the patient (receiver), such as the level of his/her education or self experience.[11]

There is a significant gap of communication between physicians and patients. The poor communication skills of many health care providers (HCPs) represent a strong barrier to patient's understanding of the provided verbal medication information.[12,13] Health care providers often use non-native languages, and technical terms (medical Jargon) to convey and

explain the medication information attributes to the patients. The use of such languages and medical jargon further aggravates the problem of poor patients' understandability.[14,15]

The difficulty in understanding the verbal medication information provided to patients by their health care providers, is also attributed to patients' poor general and health literacy, as it is the case in most of the developing countries, and also to the very short duration of the clinical encounter allowed by the health care providers, possibly due to the high patients' traffic, and the provider's time constraint.[14,15]

Other factors substantially contributing to low comprehension of medication information are type of message, number of medicines prescribed, the psychological status of the patient, age, anxiety, and level of education.[16,17]

Elderly patients, in particular, suffer a lot of poor understanding of the verbal information messages, as their cognitive abilities are compromised, they usually suffer many ailments, and are accordingly, prescribed many drugs (poly-pharmacy).

Moreover, they usually have low general and health literacy.[18]

With the aforementioned drawback of verbal medication information message (poor understandability, poor recall rates, not comprehensive), it becomes imperative that, patients, in addition to the verbal message, be provided with written medication and /or visual medication forms of medication information, to reinforce the verbal message, but not to replace it.[19]

The combination of medication information forms is reported to increase the patient's understanding and recall of medication information more than oral (verbal) instruction alone.[20]

When written medications information was coupled with verbal counseling, knowledge of medication information and compliance of Australian Vietnamese consumers, were greatly improved.[21]

But, still, HCPs don't sufficiently provide or advise patients to read and make use of the available written medication information sources, such as package inserts and medications' outer- pack labels.[22-25]

For written medication information to be useful and satisfactory to its goals, it has to be readable, understandable, and useful to patients.[26]

The low levels of general and health literacy of patients, remain the main reasons behind the poor understanding, and satisfaction with written medication information.[27,28]

The imprinted medications' outer-pack label information, together with the medications' package inserts (PIs), represent the most available and easily accessible major sources of written medication information, for both patients and their HCPs.

Both are however, difficult to be understood due to their complex design, layout, technical terms, and language as they are mostly are written in English only, which is not native Sudanese language.

Even when written in Arabic, they contain a lot of medical and pharmaceutical technical terms (jargon) which render them very difficult to understand.[29]

In order to facilitate proper patients' understanding and recall of the provided verbal and written medication information, and accordingly improve the targeted therapeutic outcomes, it becomes imperative to use the visual medication information form, (the pictograms) side by side and complementary to the verbal and written medication information forms, in an endeavor to secure a better understanding of the patients, and also to be kept for ongoing reference.

That helps patients in handling their medications more safely and properly.[30] The incorporation of visual guide is an alternative methods of conveying information to patients, as it facilitates and improve understanding of that information.[10] Among the different types of the used visual medication information forms, are the pharmaceutical pictograms, which are graphical symbols used to convey information relevant to treatment.

Pictograms associate images with concepts and can be used to display information in a clear, fast and simple manner.[31]

In fact, this concept of presenting information in the form of pictures is a prehistoric phenomenon through stone-age cave drawings and the Egyptian hieroglyphs. Sudanese people had a long history and familiarity with pictograms since the ancient Meroe Kingdom

times, that flourished from 800 BCE to 350 CE, use of Hieroglyphic symbols. Pictographic symbols were successfully used in the r first general elections in Sudan, 1953 and are still used for same purpose.

Moreover, even the illiterate Sudanese car drivers are smoothly dealing with the various road traffic signals (pictographs). The most significant international initiative for developing a set of standard pharmaceutical pictograms was coordinated by the staff of the United States Pharmacopeia (USP), who began working with USP advisory panels in 1987. This resulted in 29 pictograms being published in the 1989 issue of the USP dispensing information and this number increased to 91 pictograms in the 2000 issue. However these were developed for application in a sophisticated, technologically advanced society, reflecting the essentially westernize society. (USP-ID, 2000). Pharmacy pictograms are defined as "Ordered symbolic images that assist to communicate the medication detailed directions to patients and pharmacy customers" (USPDI, 2000). The US pharmacopeia was the first to use pharmaceutical pictograms.

Accordingly, the use of pharmacy pictograms, may help in their easy acceptance, which may prove more conducive to improved understandability and the appropriate and safe use of medications. Research in psychology and marketing indicates that humans have a cognitive preference for picture-based, rather than text-based, information.[32]

Pictorial aids help improve recall, adherence, and comprehension and are particularly useful for conveying timing of doses, instructions on when to take medicine, and the importance to completing a course of therapy.[7]

Pictograms are considered to be a part of international language and can be easily recognized by all as they transit their intended meaning with little or no dependence on language. Pictograms may improve warning comprehension for those with some visual impairment (elderly), or literacy difficulties, and can sometimes be recognized and recalled far better than words.[33]

Studies have shown that the advantage of pictograms participate positively to both understanding of medication use instructions, adherence and recall of that information.[31]

Pictograms are not considered as a replacement for verbal, and/or written medications use instructions, prohibitory instructions and regulations, but as complementary and but an

enforcement for it. Therefore pictograms must be appropriate, in easily interpretable designing and culturally sensitive to help efficiently transmitting the intended message. Otherwise they may not convey the intended message, which is the exact interpretation of their meaning, and recall of the intended information. Pictograms also serve as ongoing references for patients about their medicines.[4]

Accordingly, same to new medications' development, pictograms should firstly be tested on healthy participants from the targeted population before generalizing their use to evaluate their effects of on understanding and recall of medicines' use instructions, precautions, warnings and contraindications, and ultimately secure the intended treatment outcomes.[4]

The use of pictograms to deliver medication information to people with language barriers or limited health literacy may improve patient understanding and improve the efficiency and adherence to prescribed or advised treatment regimens of such individuals.[4]

They are also helpful to transmitting important information to those patients who find difficulty in reading and understanding because of their low levels of general and health literacy. A pictogram provides the intended meaning of an object, direction or an idea.[31]

In pharmacy, pictograms are designed to assist people to convey the information about the method to take prescribed medication, precautions, warnings and doses magnitude and timing. They have been evaluated as an essential constituent of universal language as they deliver their message without dependence on language.[31]

Given the great value of pictograms in transmitting medications information and hazards, many national and international organizations, including the American National Standard Institute (ANSI, 1991), and the organization for International Standardization (ISO, 1984) standards, have been established to evaluate their comprehensibility and easy interpretation by patients. ANSI and ISO develop criteria to test the comprehension of pharmaceutical pictogram in order to be considered acceptable must reach criteria of a least 67% or 85%. These standards have been used by many researchers for evaluation of pharmaceutical pictograms.

Rationale

Patients taking medicines need sufficient information to help them use their medicines safely and effectively, to understand the potential harms and benefits and accordingly make informed decisions about taking them.[34]

Providing comprehensive, up- dated, balanced, and understandable medication information to the patients or their representatives, in orally (verbal), written and, if needed, in visual form, on direction for use of the prescribed medication, dose magnitude and duration, advice on side effects, precautions, warnings, drug – drug and food- drug, disease-drug interactions, missed doses, over dose and/or missed doses management and home storage is very important.[35]

That provided information must fit patient's own individual needs and standards of understanding. But, as the levels of both general and health literacy are low among Sudanese people, and as the quality and quantity of medication information provided to patients by Sudanese doctors and pharmacists is deficient, it accordingly becomes imperative to use the visual form, whenever possible.[36,37] A Sudanese study reported that one thousand (1000) participant patients showed that doctors and pharmacists provided them with verbal medication information in only 40.8% and 57.8% of encounters, respectively,[38] verbal medication information is not only deficient, but is easily forgotten, misunderstood or not understood.[7-9] A Sudanese study reported that Sudanese HCPs advised patients to read the package inserts (written medication information) of their prescribed medications, in only 10% clinical encounters, thus depriving patients from an important source of written medication information.[38] Even when patients read those medication package inserts, will struggle to understand and make use of them. As the medication package inserts circulating in Sudan, themselves are very difficult to be understood by the majority of the Sudanese people as 67.74% of them are written in English only, which is not their official native Sudanese language.[39] Add to that PIs small font size, complex design, layout, and the excessive medical and pharmaceutical technical terminology (jargon) stand as real barriers to patients' understandability of PIs medication informational contents.[29] Moreover, Sudanese pharmacists used to provide patients with imbalanced verbal and deficient medication information.[40] Accordingly, the provision of medication information in more than one form(verbal, written and visual) is very important for literate and illiterate patients. In fact patients prefer to be provided with medication information in more than one form.

In Sudan as yet, we do not have auxiliary medications' labels or pictograms (visual form) to complement and reinforce the oral (verbal) and written forms of medication information. It was accordingly, decided to conduct this study, which up to researcher's knowledge is the first of its kind in Sudan. The study will be under the title:

ASSESSMENT OF THE IMPACT OF NEWLY DESIGNED, CULTURALLY SENSITIVE PHARMACEUTICAL PICTOGRAMS ON PROPER MEDICATION INFORMATION AND USE: SUDAN STUDY.

OBJECTIVES

General objective

- To assess the opinion and perception of Sudanese patients about the improvement and effectiveness of medication information comprehension and use of medicines, with newly designed culturally appropriate pharmaceutical pictograms.

Specific objective

- To design, develop, and test a set of twenty six (26) Sudanese culturally appropriate pharmaceutical pictograms.
- To assess the influence of the education of participants on their correct interpretation and acceptance of pharmaceutical pictograms.
- To identify the perception of participant patients toward pharmaceutical pictograms.
- To assess the effectiveness of the designed pharmaceutical pictograms in improving participants' correct and safe use of their medicines as prescribed by their HCPs.

MATERIALS AND METHODS

Study design

This is a cross-sectional observational and questionnaire based interview study.

Study area

The study was carried out in three public medical hospitals in Khartoum North (Bahri): Namely:

Bahri Teaching Hospital, Haj Al-safi Hospital, and Ahmed Gasim Teaching Hospital.

All the three hospitals have outpatient clinics, which are usually attended by a diverse of patients with a diverse of medical complaints.

Study period

From the 15th March to the 20 th of May 2017.

Population of the study

The study targeted all the patients who attend the outpatient clinics in those three hospitals during period of data collection. Patients from different age groups, and both sexes were included in the study population.

Potential participants' selection was based on the following criteria:

Inclusion criteria

All participant s of age 18 years and older who visit the out patients clinics at public hospital in the center of Khartoum North (Bahri Teaching Hospital, Haj Al-safi Hospital, and Ahmed Gasim Teaching Hospital).

Exclusion criteria

Participants under 18 years old, and those having health problems such as mental illness or vision problems that prevent them from being able to evaluate the images, were excluded from the study.

Sampling

Sample size

A sample of three hundred and eighty five (**385)** patients was selected.

The overall limitless population of the potential participants, time and cost, were the major determinants of the sample size.

Sampling technique

The out patients clinics in the three public medical settings in Khartoum North (Bahri), namely: Bahri Teaching Hospital, Haj Alsafi Hospital, and Ahmed Gasim Teaching Hospital, were selected for the study because those hospitals are the main public hospitals in Khartoum North, which usually receive different patients age groups, with different medical complaints(requiring different medical spescialties), easily accessible to patients, they receive different patients groups from different areas of Sudan, and accordingly represent a diversity of patients' population.

Participants were selected from those who visited the outpatient clinics of those three hospitals. Those participants who met the inclusion criteria, and who freely accept to participate in the study, were randomly selected and included in the study sample.

Study materials

After being validated by three professional pharmacist including the researcher herself, a pre-structured questionnaire was used for interviewing the participants.

Both the questionnaire and the twenty six (26) pharmaceutical pictograms were initially piloted to assess their feasibility, validity, design appropriateness, and possible comprehension problems on forty (40) potential participants. The piloting helped making minor changes on the text of the questionnaire, and the text, design, language, style and design of pharmaceutical pictograms. The piloted number was not included in the study sample.

Then each participant was face -to -face interviewed by the researcher, using both the questionnaire, and the pre-designed pharmaceutical pictograms. Participants were firstly shown the twenty six (26) Sudanese culturally appropriate pharmaceutical pictograms designed by the researcher and the graphic designer, as alternative for the pharmaceutical pictograms of the United States Pharmacopeia dispensing information (USP-DI), and were printed in an A4 paper. The presentation order of each pharmaceutical pictogram was kept consistent for all participants. The pictograms were shown to participants without their underlining written subtitles or any verbal explanation or hinting(phase 1).

Participants' responses (interpretations) were considered "correct" when they matched the specific written text subtitles given for each pharmaceutical pictogram, otherwise they were considered "incorrect". Participants were then provided with both verbal explanation for the true message and meaning of the pharmaceutical pictograms and the subtitle disclosed at the same time, as well. This represented the true judgment phase 2.

The rating of response about each pharmaceutical pictogram were evaluated using the American National Standard Institute (ANSI, 1991) provided guidelines regarding the rate of understanding matching to use as the criterion for assessing the quality of a pictogram. According to the guidelines of the American National Standard Institute (ANSI, 1991),

pharmaceutical pictograms are considered understandable when at least 85% of the participants' answers (interpretations) concerning these images were correct.

Then participants were interviewed using the questionnaire to evaluate their opinions, perception, and evaluation for the effectiveness of pharmaceutical pictograms in improving patient use of their medicines, based on each pictogram separately.

The questionnaire was composed of three parts

- part one, has four (4) questions about participants' socio-demographics,
- part two, was composed of nine questions (9) to assess the perception and opinion of the participant patients towards the pharmaceutical pictograms.

The questionnaire was originally prepared in English language, and then translated in to Arabic language version, to ease participants' understanding and data collection. Finally, it was translated back again to English to ease data analysis.

Data Collection

The researcher herself explained the objectives and the purpose of the study and informed each potential participant that he/she has the absolute freedom to accept or refuse participation in the study.

All potential participants were clearly informed that their free participation by filling or responding to the questionnaire will be considered a free informed consent.

The data was collected by interviewing patients who visit the out- patients clinics at public hospital in the center of Khartoum north (Bahri Teaching Hospital, Haj Al-safi Hospital, and Ahmed Gasim Teaching Hospital), using pharmaceutical pictograms.

A standard approach was used for all interviews, which involved only the researcher and the participant. The researcher explained to the participants the purpose of the interview and assured them that the is not a "test" for them, but rather a test of whether the pictograms were successful in conveying their intended message as apparent from the written subtitle of each pictogram. The accompanying questionnaire designed by the researcher was the main and only material for the interviews. Data was collected in three months period. Each hospitals took one month and five days each week from 9 am to 01.00 p.m.

Data analysis

Data were analyzed by Chi-Square Test using computer program of Statistical Package for Social Science (SPSS version 21).

Level of significance was set to be equal to or less than 0.05, for all analysis. The results were presented in percentages in forms of tables and figures.

Pharmaceutical pictograms were analyzed bases on American National Standard Institute (ANSI, 1991). Each pharmaceutical pictogram was considered understandable when at least 85% of the participants' answers concerning these images were correct.

The association between perception of the participants and socio-demographic characteristics was examined using Chi-Square Test.

The influence of participants educational level on the interpretation of pharmaceutical pictogram was examined using chi-square Test.

Scoring system was used to asses perception of patient about pharmaceutical pictogram. Nine (9) items were considered, the respondent's responses were graded from one (1) to three(3). If the response was positive(agree) it was assigned a score of three (3), and if the response was negative (disagree) it was assigned a score of one (1), if he response was neutral, it was assigned a sore two(2), then a summations of scores out of nine (9) was 27 given for each participant. Thus for seven (7) items, the maximum attainable score was fourteen. and the minimum was nine (9).

The level of perception of participants was classified according to the following score:
Negative perception ……. <50% (below median).
Neutral perception …….. … 50%-70%,
Positive perception ……... >70% (above median).
The perception score was tested for normality using Shapiro-Wilk.

RESULTS

Response rate was one hundred percent 100%. Results were consistently expressed in percentages.

Participants level of correct interpretation of the twenty six(26) pictograms was 82.76%, which is a quite high record.

Slightly more than three quarters of participants (76.9%) recorded more than 85% correct interpretations of twenty (20) of the tested pictograms.

Results of the study, showed that females were a majority (59%) (Fig1), and that participants were from different age groups, ranging between 19 to over 69 years. However, their majority (30%) were in the age range of 19-29 years (Fig 2). More than half of the participants (53%) received low education (primary/secondary). (Fig.3). The biggest part of the participants were of low socioeconomic background (43%). (Fig 4).

Socio-demographicsdata of participants

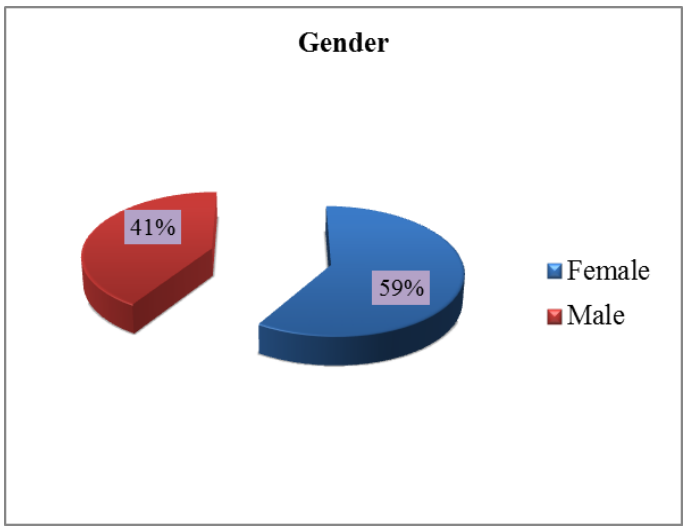


Fig. 1: Distribution of participants according to gender.

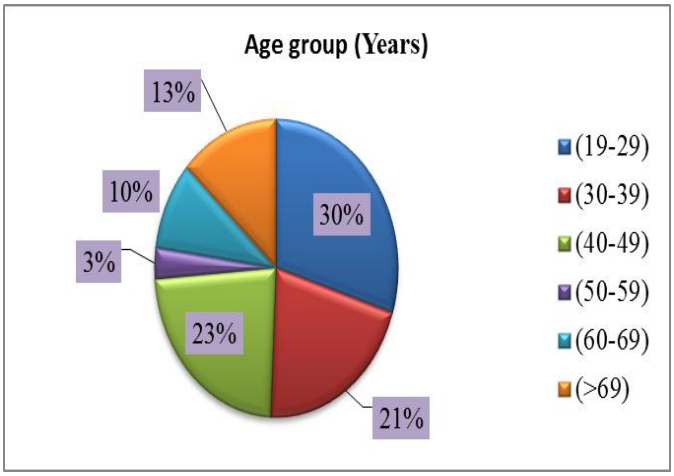


Fig. 2: Distribution of participants according to age.

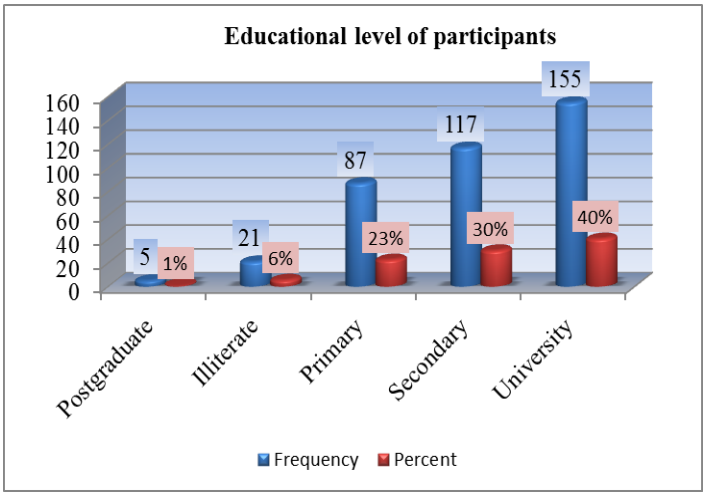


Figure 3: Distribution of participants according to education.

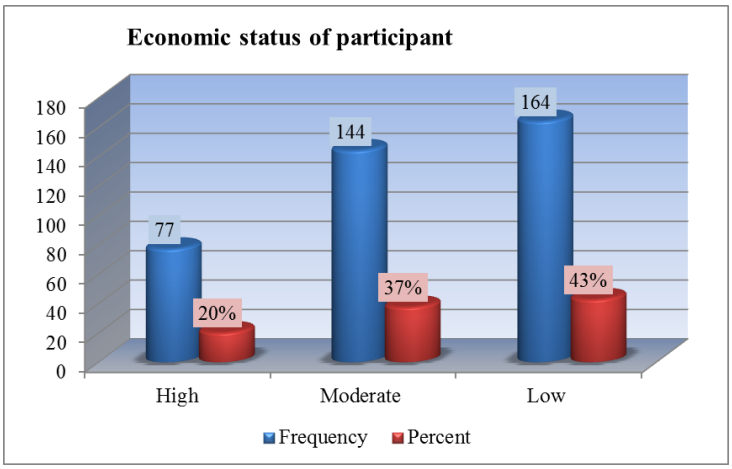


Fig. 4: Distribution of participants according to economic status.

Participants' Interpretation and understanding of the twenty six (26) pharmaceutical pictogram.

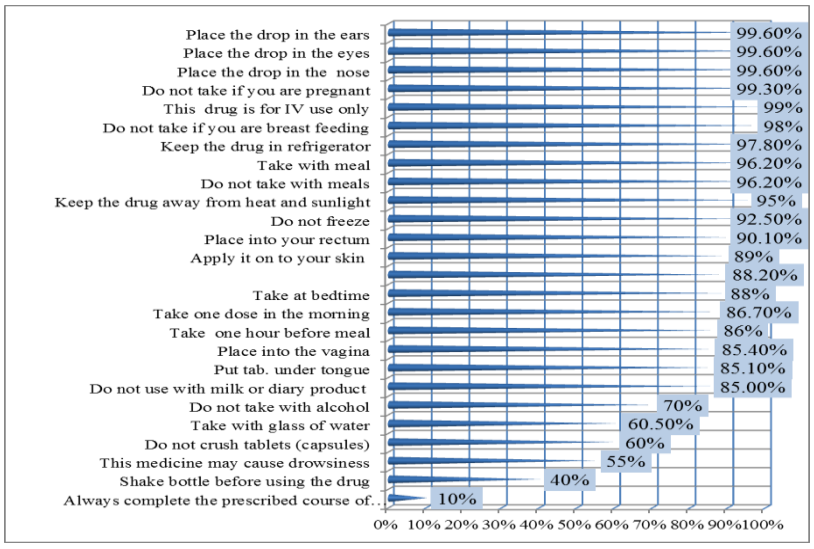


Fig. 5: Distribution of participants according to their correct identification of the different pharmaceutical pictograms.

Table 1: Correlation between participants' proper (correct) interpretation of pharmaceutical pictograms meaning, and their level of education.

Variable	Chi square (P- value)	Correlation Co- efficient
Level of education	0.04**	0.118

Assessment of preception of participants

Perception score

Total of nine (9) questions, each was given a score as following:

Agree=3

Disagree=1

Neutral=2

Maximum degree of each question is twenty seven (27) and minimum is nine (9).

Descriptive Statistics	N	Minimum	Maximum	Median	Mean	Std. Deviation
Perception score	385	9	27	23	22.04	4.7

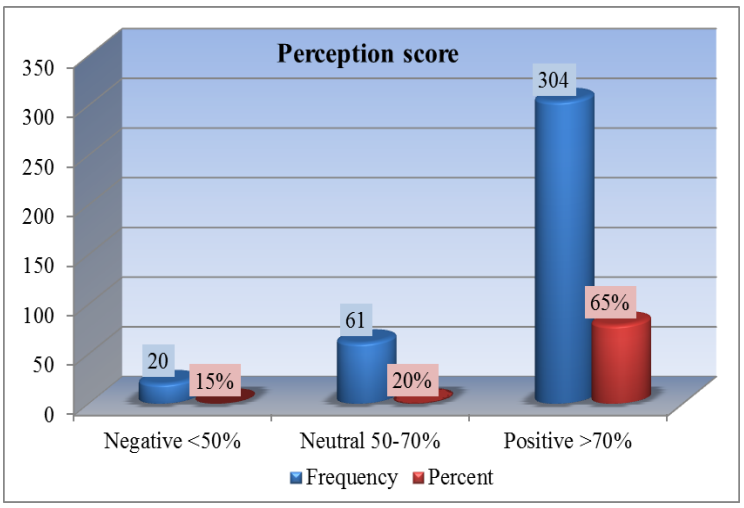


Fig. 6: Distribution of participants according to perception score.

Table2: Correlation between participants' positive perception towards pictograms, and their socio-demographic characteristic.

Variable	Chi square (*P*- value)
Gender	0.99
Age	0.04**
Level of education	0.1
Economic status	0.22

Do you think that pharmacutical pictograms can enhance patients' medications adherence?

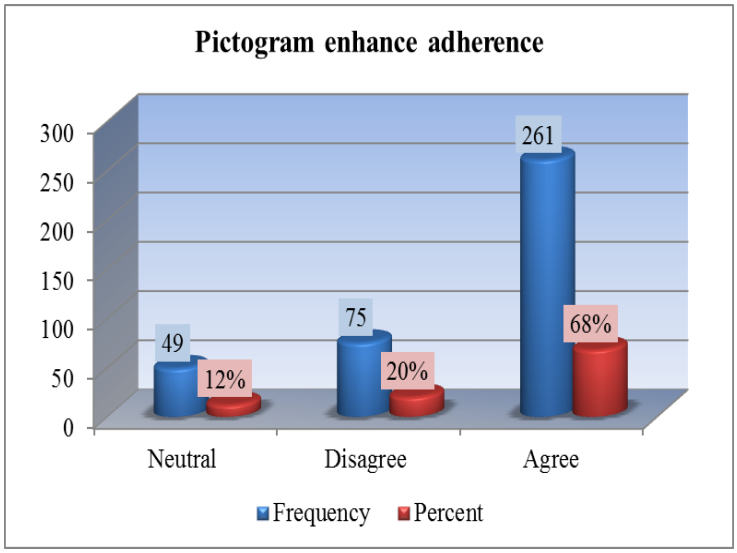


Fig.7: Distribution of participants according to their perception about pharmaceutical pictograms ability in enhancing medications adherence.

Do you think that pharmacutical pictograms enhance patients' understanding of medication instruction?

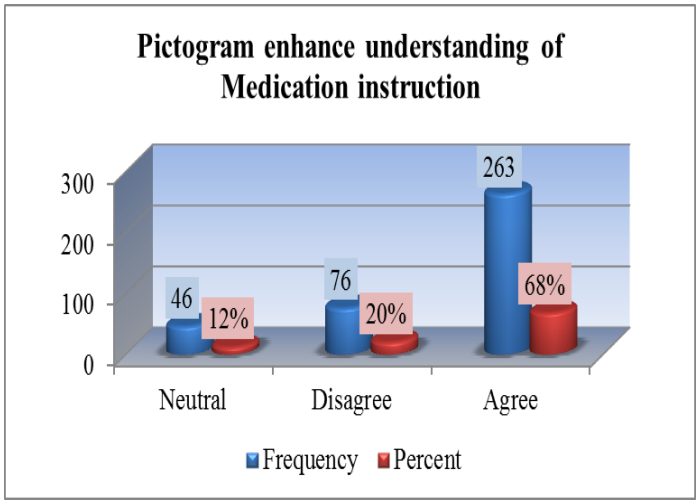


Fig. 8: Distribution of participants according to their perception that pharmaceutical pictograms enhance understanding of medication instruction.

Do you think that pharmaceutical pictograms improve patients' use of medications ?

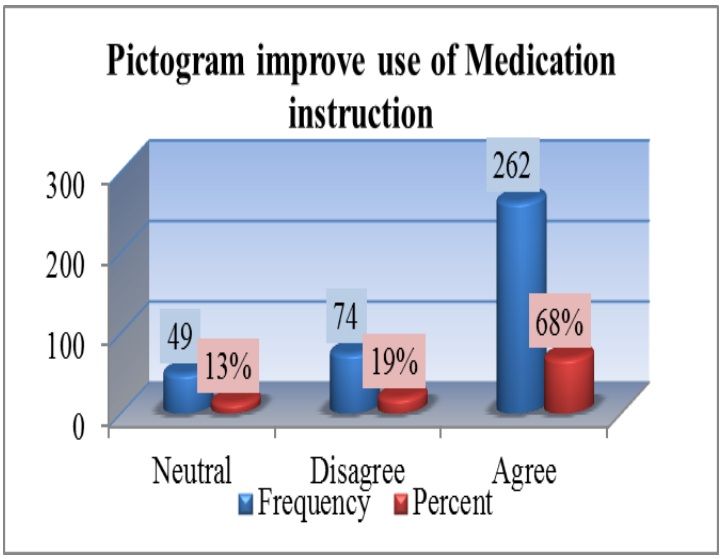


Fig. 9: Distribution of participants according to their perception that pharmaceutical pictograms improve the use of medications.

Do you think pictogram can help in improving communication between patients and health care provides ?

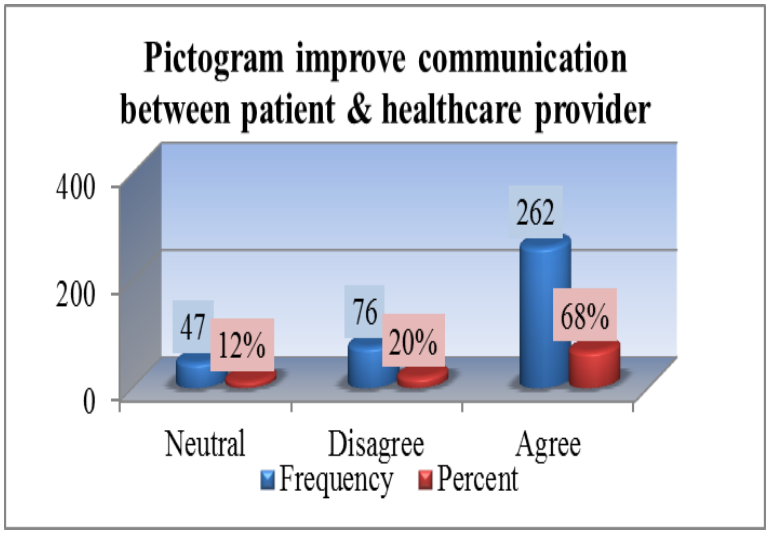


Fig. 10: Distribution of participants according to their perception that pharmaceutical pictograms may improve HCPs inter-communication.

Do you think that pharmaceutical pictogram can enhance recall of medication information?

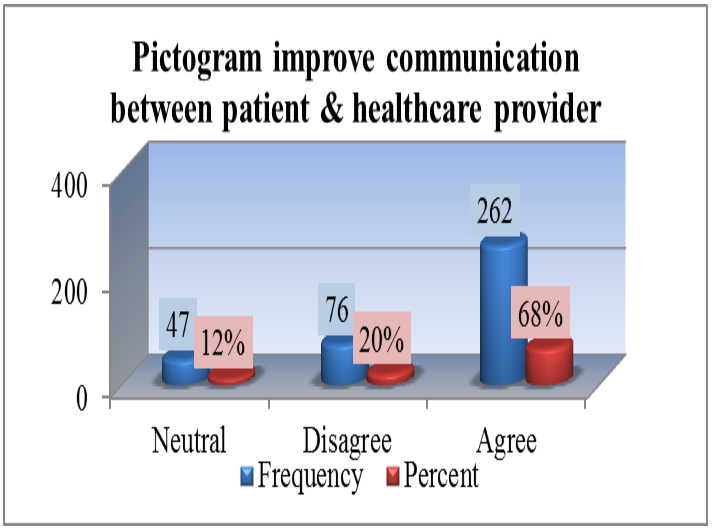


Fig. 11: Distribution of participants according to their perception that pictograms may enhance recall of medication information.

Do you think that pharmaceutical Pictogram may help decrease medications' administration errors?

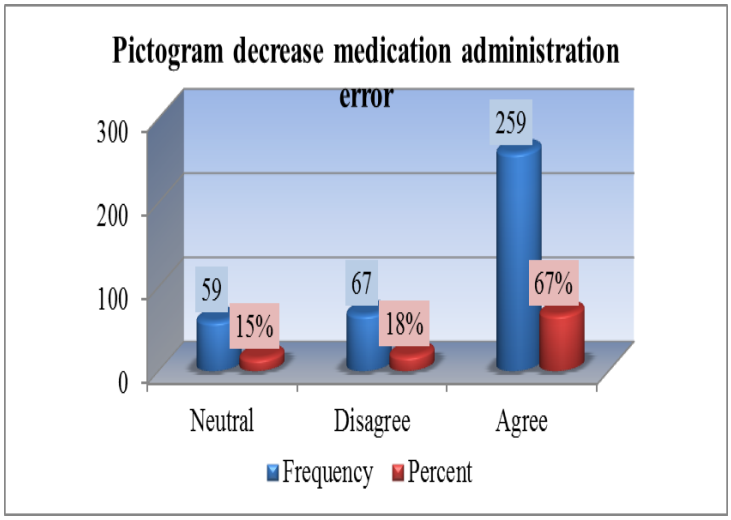


Fig. 12: Distribution of participants according to their perception that pharmaceutical pictograms may help reduce medication administration errors.

Do think that pharmaceutical Pictogram enhances patients' adherence to their medications regimens?

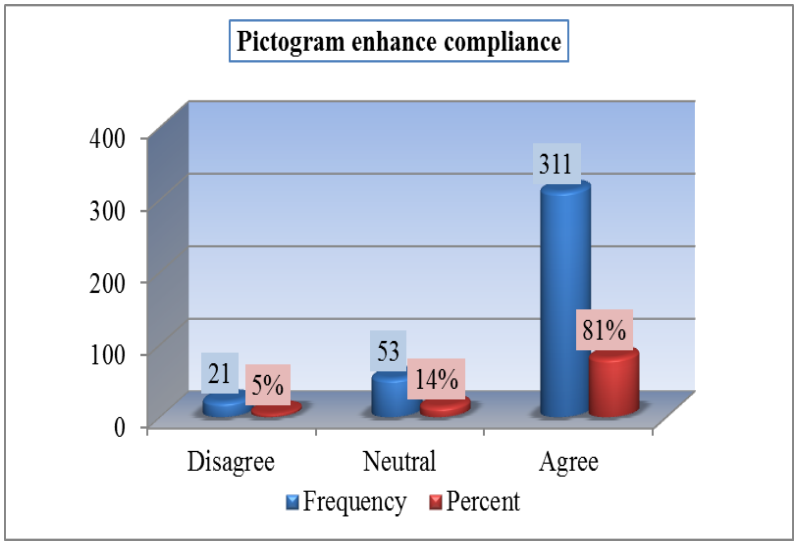


Figure 13: Distribution of participants according to their perception that pharmaceutical pictograms may enhances patients 'compliance e to their medications regimens.

Visual form is the most effective in conveying medication information to patients.

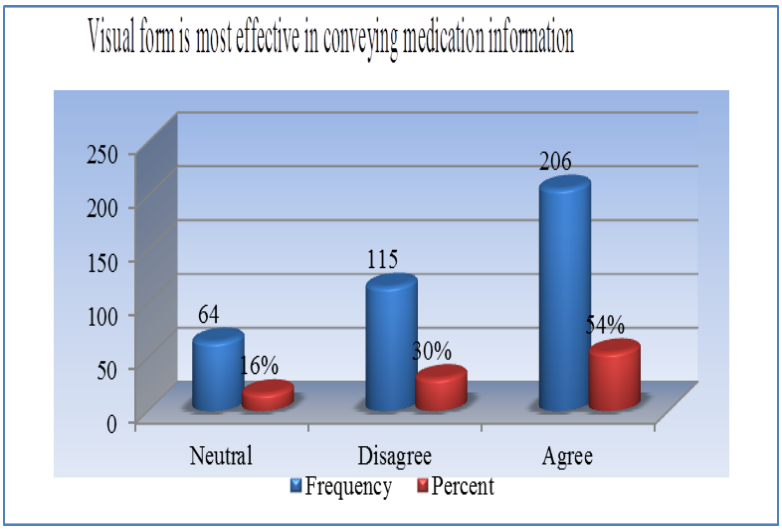


Fig. 14: Distribution of participants according to their answers that visual form is most effective in conveying medication information to patients.

Which form of medication information is more useful to you?

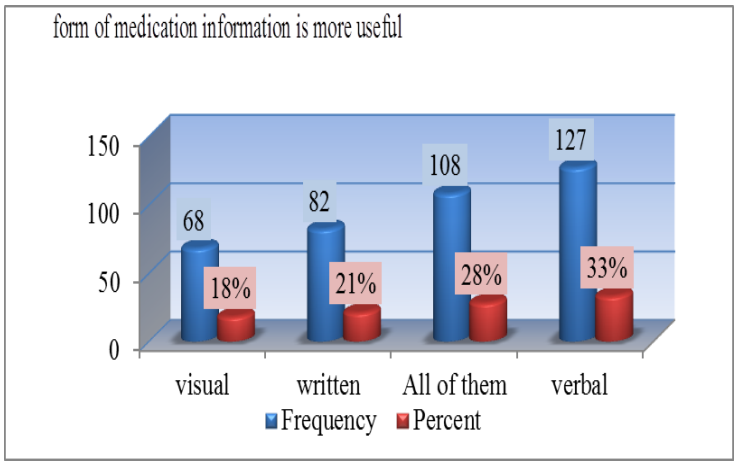


Fig. 15: Distribution e of participants according to their view that verbal, visual, written or the combination of medication information forms is the most useful for conveying medication information to patients.

Table 3: Correlation between more useful form of medication information's and socio-demographic data and characteristic.

Variable	Chi square (P- value)
Gender	0.25
Age	0.058
Level of education	0.001**
Economic status	0.91

Should pictograms be supplied to all HCPS and in all medical services settings?

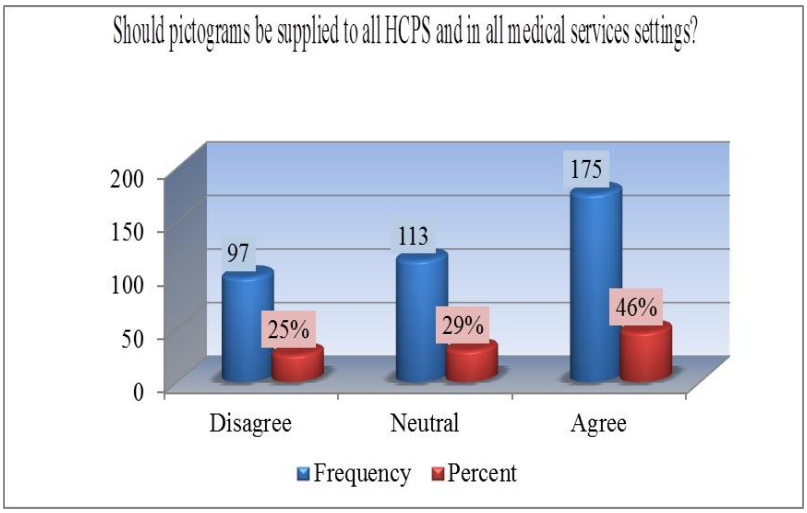


Figure 16: Distribution of participants according to their views that pharmaceutical pictograms should be supplied to all health care providers and services settings.

APPENDIX

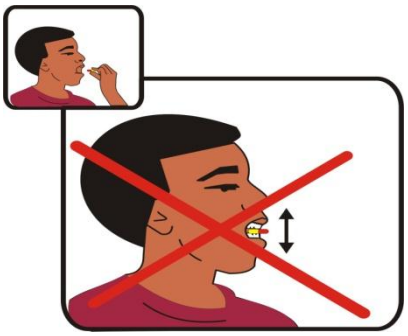
Developed pharmaceutical pictograms

Twenty six (26) Sudanese culturally appropriate and labeled (instruction for use) pictograms designed by the researcher and artist, as alternative for United States Pharmacopeia dispensing information (USP-DI).

1-Do not freeze

USPDI

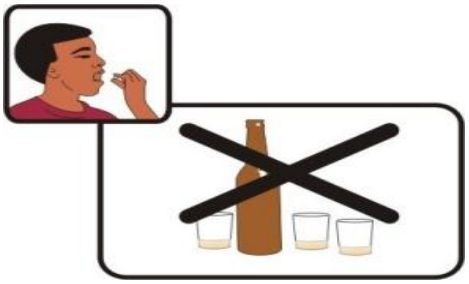
2- Do not crush the tablets (or capsules)



Do not chew the tablets (capsules)

USP-DI

3-Do not take with alcohol



Do not drink alcohol
while taking this medicine

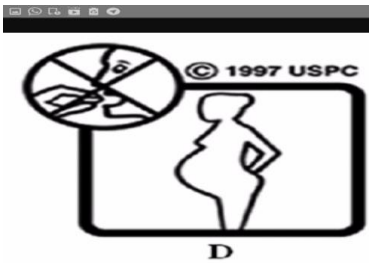
USP-DI

4-Do not take if your are breast feeding

USP-DI

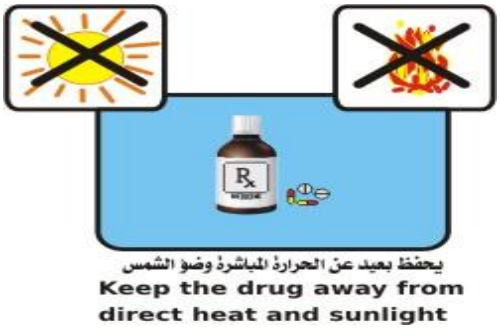
5- Donot take if you are pregenant

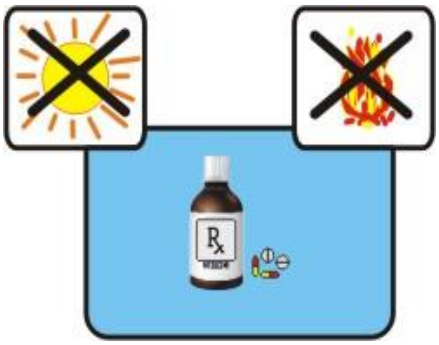
Do take if you are pregnant

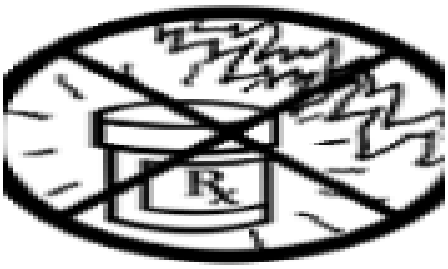


USP-DI

6- Keep the drug away from direct heat and sun light

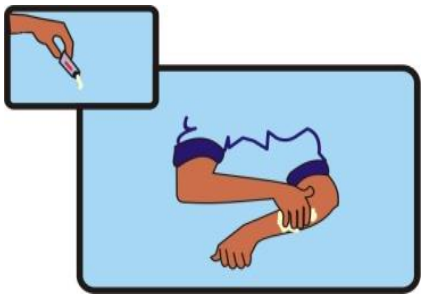


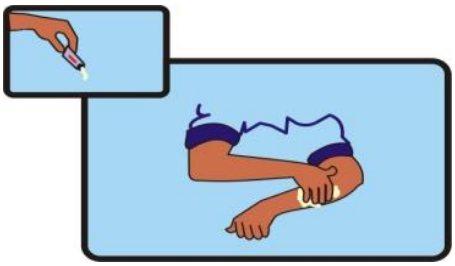




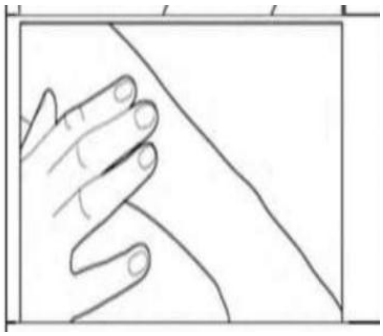
USP-DI

7-Apply it on to your skin



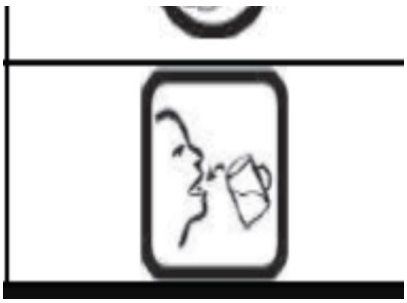


Apply it on to your skin



USP-D

8-Take with glass of water

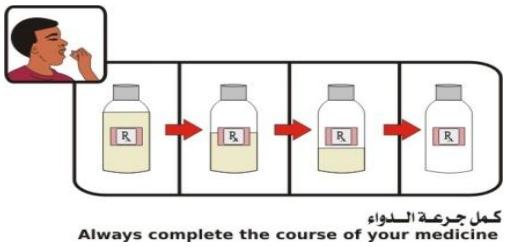


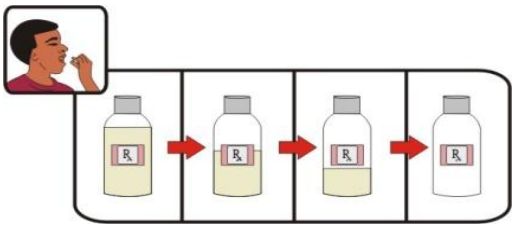
USP-DI

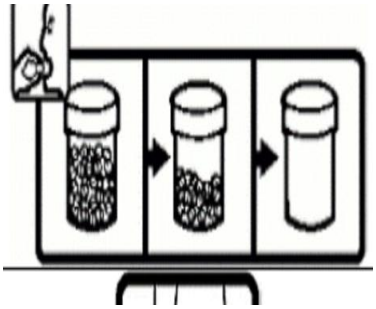
9-Shake the bottle before using the drug

USP-DI

10- Always complete the course of your medicine

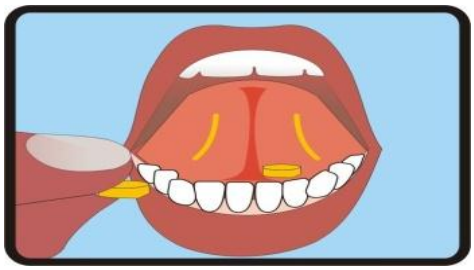


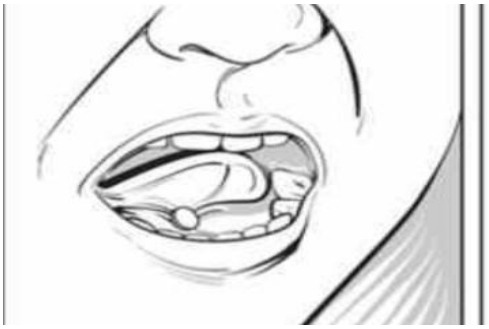




USP-DI

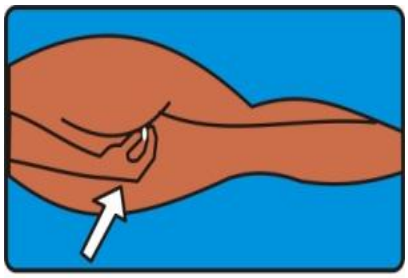
11-Put the tablet under the tongue



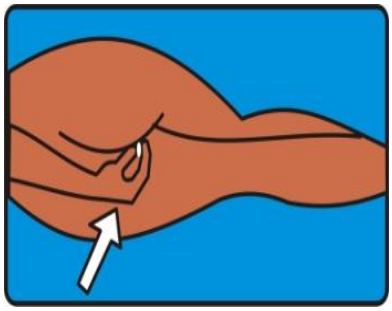


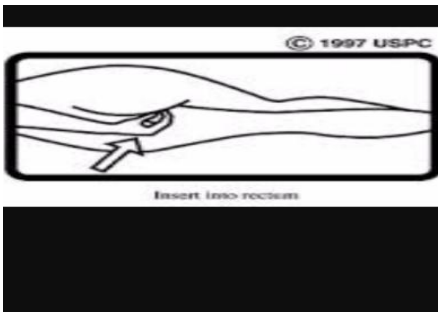
USP-DI

12-Place into the rectum



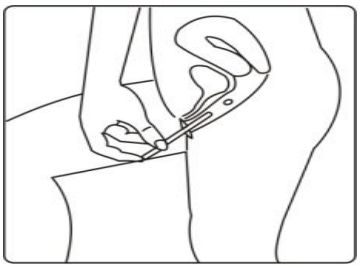
توضع داخل المستقيم
Place into the rectum





USP-DI

13-Place into the vagina



توضع داخل المهبل
Place into the vagina

USP-DI

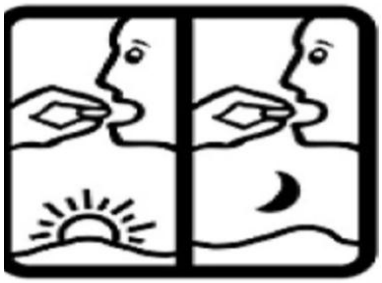
14-Do not take with meals

USP-DI

15-Place the drops in the ear

USP-DI

16- Take one tablet(or capsule) in the morning and one tablet (or capsule) in the evening.

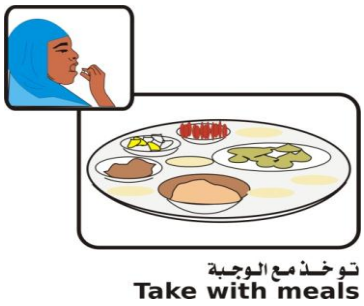


USP-DI

17-Do not take with milk or diary product

USP-DI

18-Take with meals

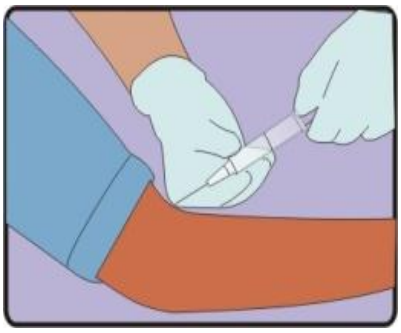


USP-DI

19-Take one dose in the morning

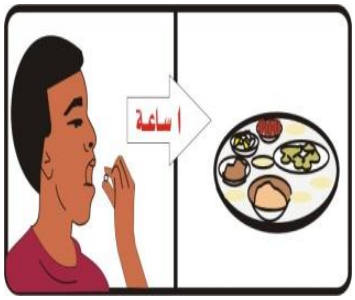
USP-DI

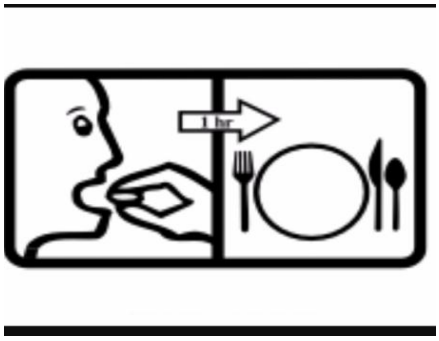
20- The drug for IV use only



USP-DI

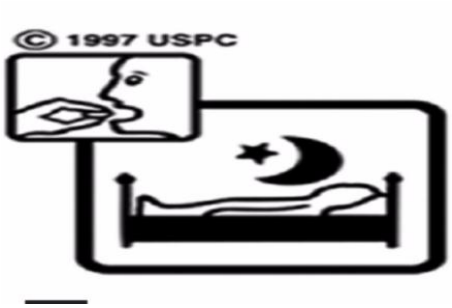
21-Take one hour before meals





USP-DI

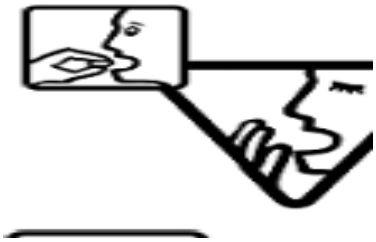
22- Take at bed time



USP-DI

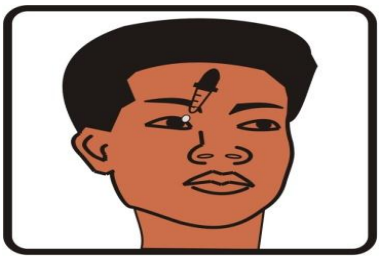
23- this medicine cause drowsiness

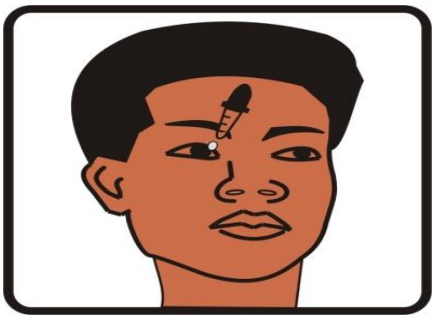
This medicine cause drowsiness

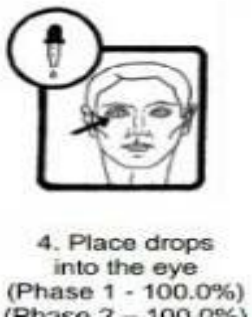


-USP-DI

24-Place the drops in the eye







USP-DI

25- Place the drops in the nose

USP-DI

26- Keep the drug in the refrigerator

DISCUSSION

The overall result of participants' proper and correct interpretation of tested pictograms rate was 85%. As per the standard set by American National Standard Institute (ANSI) a rate of proper interpretation of 76.93% could be considered as a very good result.

As per Fig. 5, the top best interpreted pictograms were

Place the drops in the ears …… (99.6%).

Place the drops in the eyes…….. (99.6%).

Place the drop in nose……. (99.6%)

While the worst interpreted pictograms were

This medicine may cause drowsiness …….. (55%)

Shake bottle before using the drug …… (40%)

Always complete the course of medicine ….. (10%)

Some participants found difficulty correctly interpreting the pictogram depicting the warning: (This medicine may cause drowsiness) and they interpreted it by saying (this medicine may cause cough), while some participants interpreted the pictogram (Take with glass of water), by saying that (take with glass of milk) because the color of the glass is white similar to color of milk.

Some participants found difficulty correctly interpreting the pictogram depicting the warning (Do not take with alcohol). This may be because the type of containers used for local Sudanese alcoholic drinks are quite different from those universally used (Fig.5). This relates to the cultural sensitivity and possibly be due to the poor piloting, and the poor involvement of participants during the development and design of that specific pictograms.[8]

Most of participants responded by saying that the medicine should be taken four time in the day instead of always complete course of medicine this may be due to four time segments (Fig.5).

These results are partially similar to those reported by a study done in University of Sharjah, United Arab Emirates that compared the interpretation of pharmaceutical pictogram between pharmacy and pharmacy student.[8] The result showed that the most comprehensible pictogram by their pharmacy students participants was “Take at bed time” which was properly recognized by 95.33% of students, while for the non-pharmacy students, the most comprehensible pictogram was “shake well” which was correctly interpreted by 91.3% of students participants. Frequently wrong interpretations were provided for pictograms depicting “chew”, “place under the tongue ”and “do not crush”.[8]

For the pictogram “Do not drink alcohol while taking this medicine”, many respondents suggested “not to be taken with soft drinks”. Pictograms warning “not to be taken with food” or “not to be taken with desserts”. were also poorly interpreted. This recalls the culture and sensitivity issues of pictograms that were frequently stressed by other investigators.[8]

These incorrect interpretations clearly indicate and stress the cultural influence. Culturally relevant pharmaceutical pictograms will be easier to understand and interpreted than the international pictograms that might not be suitable for certain societies.[8] This emphasize the need for locally designed and culturally appropriate pharmaceutical pictograms.

Pharmaceutical pictograms depicting motion are relatively difficult to correctly interpret. The results showed a positive level of perception of participants towards pharmaceutical pictograms, as the majority (79%) scored >70% points at the perception scale, with a mean score of 22±4.7 (Fig.6).

Research in psychology and marketing indicates that humans have a cognitive preference for picture-based, rather than text-based, information.[7] The results of this study showed significant correlation between participants perception and age (p value = 0.03). Younger participants were more likely to interpret pictograms correctly, as compared to older ones, possibly because they have smaller declines in cognitive abilities compared to their elder peers, and are usually better educated (Table2).This is matching to the results of a study by Barros et al., 2015.[41]

Moreover, the results of our study showed a significant association between participant level of education and correct interpretation of pharmaceutical pictogram (p=.004) where participants who received higher levels of education were more likely to interpret pictograms compared to those with lower education levels,(Table1).

The education level is a critical factor in determining people's understanding of the information: a lower education level is mostly associated with poorer understanding.[3]

However, no association between perception of pictograms and each of economic status, and gender (p value = 0.22, 0.1, respectively (Table2).

This result is complying with the result of Study by Katz et al, 2005.[7] which reported significant association between economic status, and level of participants education with perception of pharmaceutical pictograms.

A majority (68%) of participants agreed that pharmaceutical pictograms can enhance adherence (Fig.7), comprehension and understanding for medication use instructions (Fig. 8) and improve communication between the patients and health care providers (Fig.10). They as well, can decrease (67%) medication administration errors (Fig.12), and can fairly enhance (57%) recall of medication information (Fig.11).

Fifty four percent (54%) of the participants agreed that the visual medication information form is the most effective in conveying medication information. (Fig.14). About half of

participants (46%) asserted that pharmaceutical pictograms should be supplied to all concerned health care providers in different medical services settings (Fig.16).

Including pharmaceutical pictograms in HCPs counseling of patients is proved to improves the comprehension of medical information and instructions for use of medications especially by elderly patients. Moreover, pharmacists' counseling of patients is an integral provision of the pharmaceutical care mode of pharmacy practice, which stipulates the use of visual aids (pictograms) to augment and increase comprehension.[42,43]

The majority of seniors in one study found pictograms useful for conveying medical information when the pictograms were supplemented with the written text, as they can also be easily recognized by those having low general and health literacy and visual impairment.[44]

Almost one third (33%) of the participants, in this study, thought that verbal form of medication information is the most useful (figure15). These results are partially similar to study by Dowse et al., 2011.[45] The study demonstrated that pharmaceutical pictograms are effective for improving participants' understanding and recall, when combined with written text (subtitles), and verbal instructions.

Research has clearly shown that pharmaceutical pictograms should not be used as the sole source of communication, as they do not convey enough message details.

Pictorial aids improve recall, comprehension of information, help improve adherence to advised medications' regimens, and are particularly useful for conveying timing of doses, medications use instructions, and the safe use of medicines, by observing precautions, warnings, and contra-indications.[46]

Therefore, in medical practice, pharmaceutical pictograms must be accompanied by verbal and written information to avoid possible misinterpretation, which can cause confusion and medication errors and to be kept for ongoing reference.[47]

Also the result of this study showed significant correlation (p=0.001**) between more useful forms of medication information for patient and level of education (Table3).

University graduated participants preferred the verbal form of medication information. That may be because verbal medication information is usually individualized and the patient can get immediate clarification from the HCP to his/her any possible queries. Participants with secondary school education preferred a combination of both verbal and written medication information, as the provided verbal medication information is not comprehensive, easily forgotten and cannot be kept for ongoing reference. Combining verbal information with written form is reported to be preferred by patients themselves.[48]

Low literate participants preferred visual form of medication information. That may be because images interpretation unlike written text, does not require reading abilities, and can easily be comprehended.[49]

Moreover, written medication information is difficult to comprehend due to its complex nature, language, style, technical terminology, small font size and it mostly does not fit their individual needs for medication information.[38]

Unlike study published in Qatar that evaluate comprehension of the pictograms or conventional text supported with verbal instructions in foreign workers with low literacy skills. This study found that pictogram plus verbal medications use instructions achieved better results in interpreting the majority of the label instructions.[50]

CONCLUSION AND RECOMMEDATION

From the results of this study the following points can be concluded

- Paticipants' level of correct interpretation of the twenty six(26) pictograms was 82.76%, which is a quite high record.
- Slightly more than three quarters of participants (76.9%) recorded more than 85% correct interpretations of twenty (20) of the tested pictograms.
- Generally most of patients have positive perception towards pharmaceutical pictograms.
- A statistically significant association was observed between each of participants' educational level with correct interpretation of pharmaceutical pictogram (p=.004), participants who received higher levels of education were more likely to interpret pictograms compared to those with lower education.
- A statistically significant association was observed between each of participants' age and their perception of pictograms, younger participants were found to be more likely to interpret pictograms correctly, as compared to older ones.

- Participant patients agreed that pictograms enhance medication adherence, and help to increase patients' understanding of and adherence to prescribed medication therapies, especially among patients with limited understanding.
- Pharmaceutical pictograms were found to contribute positively to both understanding of medications and use instructions, and Adherence.

Accordingly from the study findings the following can be recommended

- There is a need to design a more bigger number of new, culturally adapted pictograms, covering different medications' use safety and effectiveness attributes, and to validate them to enable their use in a geographically large country with distinct regional characteristics, and diverse population, such as Sudan.
- Patients shall be involved in the design of pictograms and their perspectives should be taken into account.
- Pictograms should be pre-tested on targeted population prior to using them widely, to identify whether or not a particular message can be more effectively conveyed to target audience by a pictogram.

Pictograms must be displayed in conjunction with verbal and written information in order to ensure that the correct message is communicated.

Study limitations

ACKNOWLEDGEMENT

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Conflict of interest

The authors hereby declare that they received no funding for this study which was wholly funded by them.

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