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Jimma University, Collage of Public Health and Medical Science,

Department of Radiology.

MEGA PROJECT: Diagnostic Imaging methods, Development and Evolution

PROJECT MEMBERS

Dr Gemechis Asefa (MD, Resident)……Principal investigator

Dr Wondim Getnet (MD, Radiologist)……..CO investigator1

Mr Tsegaye Tewelde (MPHE, BSC)…….....CO investigator2

Mr Mesfin Zewdu(MSc, Medical Physics) .....Investigator

Dr Gemechu Geleto (MD, Resident)..... Investigator

RESEARCH TOPIC: Knowledge on Ionizing Radiation Associated Hazards and Protective Measures during Medical Imaging among Patients Waiting for Common Radiologic Imaging in Jimma University Specialized Hospital.KNOWLEDGE ON IONIZING RADIATION ASSOCIATED HAZARDS AND

PROTECTIVE MEASURES DURING MEDICAL IMAGINGS AMONG PATIENTS

WAITING FOR COMMON RADIOLOGIC IMAGING IN JIMMA UNVERSITY

SPECIALIZED HOSPITAL

BY DR GEMECHIS ASEFA

RADIOLOGY RESIDENT

A THESIS TO BE SUBMITTED TO JIMMA UNIVERSITY COLLEGE OF PUBLIC HEALTH AND MEDICAL SCIENCE; DEPARTMENT OF RADIOLOGY AS PARTIAL FULFILMENT OF THE REQUIRMENT FOR SPECIALITY CERTIFICATE IN RADIOLOGY

Mar, 2014 G.C

JIMMA, ETHIOPIAKnowledge on Ionizing Radiation Associated Hazards and Protective Measures During Medical Imaging Among Patients Waiting for Common Radiologic Imaging In Jimma University Specialized Hospital.

By Dr Gemechis Asefa

(Radiology Resident)

Advisors:

1. Dr Wondim Getnet (MD, ASST. PROF. JUSH RAD. DEPT)

2. Mr Tsegaye Tewelde (MPH, Epedimologst, Lecturer)

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Jimma, Ethiopia

Summary

Radiologic Diagnostic and therapeutic procedures using ionizing radiation carries well-known potential health risks.

The knowledge of the referring physician and patients on modalities of diagnostic imaging and procedures that use ionizing radiation varies widely. Their knowledge was generally inadequate. Patients' radiation knowledge strongly influences their acceptance and preference of diagnostic imaging types.

Objective: The main objective of the study is to assess knowledge on ionizing radiation associated hazards and protective measures during medical imaging among patients waiting for common radiologic imaging in Jimma University Specialized Hospital (JUSH), Ethiopia.

Methods: Hospitals based cross sectional study design were conducted on 388 patients waiting for common radiologic imaging and procedures in JUSH, at radiology department. A structured questionnaire was used to collect data from voluntary patients. Data was cleaned, edited and entered to SPSS version 16.Data was expressed as frequency distribution and percentages. Categorical variables were compared using the chi-square test for association. A P value of less than 0.05 was considered statistically significant.

Results: A total of 386 voluntary patients were included, of which 225(58.3%) of them were male. Their age range was from 14 years to 85years. In 28.2 % importance of imaging and likely associated harmful effects of radiation were discussed with referring physician. All of imaging unit referral was by the physician. An half of the respondents 193(50%) had back ground information about radiation. The majority of the participants, 356(92.2%) responded that they knew conventional x-ray. Twenty nine (7.5%) patients did not indicate any one of the equipment. Only 203 (52.6%) patients indicated the association health hazard with radiation. Sixty five (16.8%) were incorrect in their assumption that ultrasound examinations uses of ionizing radiation and 32 (8.3%) of them were not aware of ionizing radiation free nature MRI imaging. Majority of the patients 152(39.4%) had indicated infertility followed by cancer, 130 (33.7%) as specific health effect of ionizing radiation. About 122(31.6%) of patients indicate gonads as highly sensitive organ. Ultrasound and MRI indicates as safe modality during pregnancy in 32(8.3%) and 4 (1%) respectively, where as plain abdominal x-ray and CT as safe for pregnant mother in 4(1%) and 5 (1.3%) respectively.

More than 95% of the respondents had no idea about background radiation and radiation protection symbol was known only among 15 (3.9%) patients. A large number of patients 292 (75.6%) responded that they had no idea about protective measures while diagnostic imaging. Most of (96.1%) the patients had no idea about the application of radiation rather than for their imaging purpose use.

An association of effect the education and information on patients' knowledge about radiation was revealed.

Conclusion

This study has shown the inadequacy of patients' knowledge on possible radiation associated health hazards, radiation protection measures and applications of radiation that is in general agreement with the results of other similar surveys. Thus intervention should be done on the line of improving our patients' knowledge about radiation issue.Acknowledgements

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BIOLOGICAL EFFECTS OF IONIZING RADIATION

NCRPM NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENT

PET POSITRON EMISSION TOMOGRAPHY

SNNNPR SOUTHERN NATION, NATIONALITIES AND PEOPLES' REGION

SPSS STATISTICAL PACKAGE FOR SOCIAL SCIENCES

SPECT SINGLE-PHOTON EMISSION COMPUTED TOMOGRAPHY

SV SIEVERT

UNSCER UNITE NATION SCIENTIFIC COMMITTEE ON THE EFFECTS OF ATOMIC RADIATION

USG ULTRASONOGRAPHY

UNSCEAR UNITED NATIONS SCIENTIFIC COMMITTEE ON THE EFFECTS OF ATOMIC RADIATION

Chapter One: Introduction

1.1Back ground

Radiation has always been & is present around us. All life has evolved in an environment filled with radiation. Radiation is energy that propagates through matter or space. (1, 2) Radiation

energy can be in the form of wave or particulate. (2)

Radiation is usually classified into non-ionizing and ionizing radiation. Non-ionizing radiation has less energy than ionizing radiation; it does not possess enough energy to produce ions. Examples of non-ionizing radiation are visible light, infrared, radio waves and microwaves. Ionizing radiation has the ability to knock electrons off of atoms, changing its chemical properties. This process is referred to ionization (hence the name, ionizing radiation). (2-4)

There are four main types of ionizing radiation: these are Alpha radiation (α), Beta radiation (β), Photon radiation (gamma [γ] and X-ray) and Neutron radiation (n). (4)

Scientists have known about radiation since the 1890s. They have developed a wide variety of applications. Today, to benefit humankind, radiation is used in medicine, academics, and industry, as well as for generating electricity and energy. In addition, radiation has useful applications in such areas as agriculture, archaeology (carbon dating), space exploration, geology (including mining) as well as material analysis(security)and many others.(6)

Ionizing radiation includes the radiation that comes from both natural and man-made materials. (4, 5)

The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) identifies four major sources of public exposure to natural ionic radiations: Cosmic radiation, Terrestrial radiation, Inhalation and Ingestion. The total worldwide average effective dose from natural radiation is approximately 2.4 mSv per year; in Canada, the average effective dose is 1.8 msv.(4) Normally, there is little we can do to change or reduce ionizing radiation that comes from natural background sources like the sun, soil or rocks.(4)

The National Council on Radiation Protection and Measurement (NCRPM) in United State had reported, in 18% of manmade radiation, around 15% of radiation exposures are due to the medical x-rays and nuclear medicine imaging. (7, 8)

The ionizing radiation that comes from man-made sources and activities need to be controlled more carefully. There are two types of photon radiation of interest for the purpose of this document: gamma (γ) and X-ray. Photon radiation can penetrate very deeply and sometimes can only be reduced in intensity by materials that are quite dense, such as lead or steel. (4, 5)

Ionizing radiation is the main concern for health effects since it can change chemicals' properties in the human body or tissue. (2-4) Biological effects of radiation are derived principally from damage of ionizing to DNA. It results in either single stranded breaks or double stranded break.2 Single stranded breaks are usually well repaired with minimum bio effects. Breaks in both

strands of DNA are more problematic to repair and underlie disruptive function that can result in cell death (deterministic) or in impaired cellular function resulting in the development of cancer (stochastic). The inappropriate repairs with resultant stable aberrations can initiate one of the multi-step processes in radiation induced carcinogenesis. (3, 4)

The occurrence of particular health effects from exposure to ionizing radiation is a complicated function of numerous factors including radiation type, dose, doses rate, Part of the body exposed, age and biological differences. (5) The radio susceptibility of cells, tissues, and organs of individuals totally differ. Cell radio sensitivity is directly proportional to the rate of cell division and inversely proportional to the degree of cell differentiation. As a person ages, cell division slows and the body is less sensitive to the effects of ionizing radiation. This also means that a developing embryo is most sensitive to radiation during the early stages of differentiation, and an embryo or fetus is more sensitive to radiation exposure in the first trimester than in later trimesters. (5, 9)

The cancer risks associated with radiation exposure have been known since long time. Its potential for harm has been demonstrated by the deaths of early radiation workers. (10) From previous epidemiological studies, the lowest dose of ionizing radiation which has a good evidence of carcinogenicity is between 10-50 mSv. (11) All doses, however low, have the potential to cause harm. Data acquired from atomic bomb survivors in Japan and victims of the Chernobyl nuclear accident in Ukraine show that comparatively smaller dose of radiation used in medical imaging could also increase the risk of cancer. (13)

The radiation exposure dose for one chest radiograph is 0.02 mSv and for an abdominal CT it is 9 mSv (11). The radiation dose received from one chest radiograph is less than that received from background radiation per day (12).

The lifetime cancer risk for children exposed to diagnostic radiation is substantially higher than for adults.(8) In February 2001Brenner et al.(15) they reported that a young child undergoing CT has an increased lifetime risk of fatal cancer of approximately 1 in 1,000 (0.18% for CT abdomen, 0.07% for CT head) . Generally the lifetime cancer risks of radiation were different among individuals. (14-18)

Modern imaging equipment allows adjustment for patient size and anatomy to allow closer adherence to the As Low As Reasonably Achievable (ALARA) principle (e.g. using adjusted CT settings in children compared to adults, the amount of radiation is reduced by a factor 6-7. (19)

The International Commission on Radiological Protection (ICRP) began to develop the risk

versus benefit concept since 1977. It recommended all patient exposures must be justified, kept as low as possible and doses should be limited. (20) So following the ICRP principles during work with radiation is highly recommended to reduce radiation exposure doses.3

1.2Statement of the problem

Radiology department uses different imaging modalities which uses both ionizing radiation (such as x-ray, fluoroscopy, mammography, nuclear medicine and computer tomography) and non ionizing radiations (such as ultrasound, magnetic resonance imaging) for diagnostic and therapeutic intervention purposes. Exposure to ionizing radiation cannot be avoided totally in medical imaging facilities but is possible to decreases exposure by following the International Commission on Radiological Protection (ICRP) recommendations. This is possible only if the patients the treating physician and the radiation workers familiar with the recommendation. Increasing concern has recently been expressed in the literature that the patients undergoing diagnostic imaging examinations have inadequate knowledge and awareness about radiation. (35) The knowledge on the radiation protection measures of the clients affects the chances of their exposure for ionizing radiation. There are many researches done on the knowledge and awareness of radiation hazards and protective measures worldwide. Most of the researchers focus on the health professionals. The studies show the knowledge of the health professionals about radiation is not adequate. (24-34) Regarding the knowledge assessment about radiation, only few studies have been conducted on patients.

According the research done in India (35) which has made an in-depth interview on patients' knowledge about ionizing radiation risks has revealed the patients' perception on radiation was not adequate. The patients perceived x-ray has no harm, thought x-ray was the only way to detect their problem and without x-ray they will not be cured. Similarly cross sectional research conducted in Turkey (34) which focuses more on hazards of ionizing radiation, majority of the patients do not consider radiation associated cancer risks. Several other studies have been done in different parts of the world demonstrated similar trends about patients' knowledge on radiation hazards. (34-39)

Because of the low level knowledge on the radiation, unsafe application of it in imaging has been rampant. In the recent survey it is reported that approximately 30% of all radiological exams prescribed by the medical doctors are not clinically indicated. (21) Some of the imaging were done on the requests of the patients. (37) This should be discouraged.

The patients knowledge of the radiological imaging equipment in detail help them to prefer one

type of imaging techniques over the other like ultrasound and MRI over CT or other imaging modalities that uses ionizing radiation. That also helps to avoid unnecessary examination which exposes them to high radiation unnecessary.

Patients, family or attendants of the client should know how to protect themselves from radiation exposure. It was advisable that patient or attendant should know the symbol for medical radiation emitting sources at the unit of imaging. They should know the importance of keeping themselves away from area of radiation sources. The request should be justified, do not be on the request of the patient or the family or not for psychological satisfaction. They should know that the part of4 their body not under examination should be covered with the protective shield like lead. Additionally they should know that they don't have to wonder within imaging rooms while other patients are under examination. (20) This is only practical if patients have knowledge on the ICRP recommendation.

Generally it is the responsibility of the treating physician and the radiation workers to inform the patients about radiation. A number of studies show that it is less practiced. (37)

Advancement in Medical imaging equipment using ionizing radiation, unsafe application without clinical indication and patients' self-requests all increases unnecessary radiation exposure. This fact makes assessment of the current level of patients' knowledge about ionizing radiation and protective measure is advisable in order to take appropriate interventions.

As far as I know, regarding patients' level of knowledge about risks of radiation and protective measures have not been studied in Ethiopia until now. With these facts in mind, this study aims to undertake a survey to assess patients' knowledge about the radiation hazards and protective measures during diagnostic radiological imaging and procedures at JUSH.5

Chapter Two: Literature Review

2. 1 Literature review

In spite of the biological hazards of x- ray and gama rays, enormous benefits were derived from its application in the medical imaging. The increasing amount of ionizing radiation that is received from controllable artificial radiation resources on work gives rise to possible risks of developing cancer over the course of a lifetime and hence constitutes a threat to public and patients health.(18,21) Radiation exposure over a long period of time (years) produces stochastic effects (NCRPM, 1980).(22) All diagnostic imaging (CT, nuclear medicine, and radiography and fluoroscopy) radiation doses are at the levels which are stochastic. (22, 23) There is no threshold level of radiation exposure below which it could be said with certainty that cancer or genetic

effects will not occur. Doubling the radiation dose doubles the probability that a cancer or genetic effect would occur (Kondo, 1993). (24)

From the literature and our own experience, it is extremely important to thoroughly and carefully educate patient about radiation exposure levels and perceived or actual health risks. Treating physician and radiation workers should explain the imaging procedure to the patient and explain the benefit vs risk of radiation which is very essential in any healthcare setup. One study conducted in Port Harcourt, Nigeria highlights the deficiency of treating physician which might affect the expected benefits compared to the risks involved in diagnostic imaging. It has reported that 60% of the patients were not explained about the diagnostic procedure by the radiation workers (37).Another study from Hong Kong, China shows most patients (98.2%) were told the indications, and only 42.7% were told the associated radiation dose and risks. (38)

There are different studies carried out to assess clinician knowledge on ionizing radiation uses. According to survey in Northern Ireland, non-radiologic clinicians have poor knowledge of the radiation doses and radiologists have good knowledge of radiation doses and risks (30).Other studies on the Iranian (32) and Ethiopia physicians (33) also show deficiency in knowledge. Both studies recommended the need for training on radiation doses required for diagnostic imaging to reduce the patients' radiation dose and risks.

Several studies have been done worldwide to assess clinician knowledge on non-ionizing nature of ultrasound and MRI. The above mentioned study done in Ethiopia, at Tikur Anbessa Specialized Hospital (TASH), Addis Ababa University (AAU), has studied on physicians' knowledge on the risk free nature of both Ultrasound and MRI. Those who responded that both use ionizing radiation were 5.3% and 7.1% respectively. (33) Another study in TASH, AAU, which included 350 medical students shows 71.4% and 79.3% incorrectly believed that ultrasound and MRI, emit ionizing radiation or they do not know whether they emit radiation or not, respectively. (40)6

A cross-sectional survey done to assess Knowledge about Ionizing Radiation and Radiation Protection among Patients awaiting Radiological Examinations carried out in the university hospital Turkey on 224 patients. The majority of patients (91.5%) had had previous radiological examinations. Many of patients knew that x-ray could cause cancer (73.2%) and fetal anomaly (69.2%). About 46.9% of them knew what radiation means. While 68.3% of patients knew that radiography use x-ray, only 33% of them knew that mammography uses x-ray. They responded that conventional radiography (72.8%) and CT (71.4%) were harmless during pregnancy.

Additionally 44.6% of them also believed MRI uses x-ray and 66.5% avoided this examination during pregnancy. While 20.5% of them knew that CT contained more x-ray than radiography, 73.2% had no idea about this issue. Interestingly, 22.3% of patients declared that thick cloths could protect them from harmful effects of x-ray. Comparison of the patients who knew that radiation could cause cancer and who did not significantly differed according to educational levels. (P=0.032). (34)

Another cross sectional research done On 173 local patients at Medical and Geriatric Department, Kwong Wah Hospital, Hong Kong, China. The study shows Patient radiation knowledge is not adequate. From the study 60.7% and 32.7% were not aware of the radiationfree nature of MRI and USG, respectively. The misconception that Barium enema and Barium swallow studies do not involve radiation was 45.4% and 43.5%, respectively. Moreover, 77.6% and 87.9% were aware of the radiation risk from CT and plain X-rays, respectively. Furthermore, 34% think that they are not exposed to radiation at home. Regarding the fatal cancer risk from CT, 62% underestimated the risk. 32.2% correctly estimated the equivalent dose of CT in terms of number of conventional X-rays and 43.2% underestimated the dose. Most (98.2%) were told of the indication, and 42.7% were told the associated radiation dose. Finally the author suggested the need to increase patient radiation risk awareness, and to provide them with the necessary information. (38)

Additional radiation safety awareness survey among radiation workers and patients conducted at Mulago Hospital, Kampala, Uganda. The study included 70 individuals, 50 patients and 20 radiation workers. This study shows a large number of the patients were of the view that x-rays were dangerous (43%) while some thought they were not dangerous and 14% of them have no idea. The investigator also noted a large number of the patients were ignorant of the radiation symbols (95.7%) and this implies that they could innocently walk into a radiation field. Many did not mind standing in areas where they could be exposed and saw no danger working with radiation. Half (50%) reported that x-rays reduce or affect the life span in some way. 83.3% of the patients had no idea on how to protect themselves from radiation. None of the patients knew about background radiation (39)

Similarly radiation safety awareness study among patients and radiographers in three hospitals in Port Harcourt, Nigeria on one hundred and fifty (150) patients (70 individuals) and radiographers (80 individuals) carried out. This study has shown the patients' awareness of the dangers of ionizing radiation is very poor while level awareness by the radiographers is unacceptable. Only7

44 (58.7%) of the radiographers reported that they were aware of the dangers of ionizing radiation. Eight (13.0%) of the patients were aware while 52 (86.7%) were not aware. The percentage (86.7%) of patients who did not know that X-rays were dangerous was very high and unacceptable. This placed a big responsibility on the radiation workers to explain and protect them. (37)

The same study further showed that majority (85.7%) of the examinations were requested by the physician although there were a few cases (14.3%) of self-requests. This researcher concluded Less than 50% of the radiographers and less than 40% of the patients were aware of the dangers of ionizing radiation and protective measures. Finally, he recommended hospital managements should design a program which would emphasize patient education like introductory talks every morning before work begins. Information posters should be displayed throughout the hospital, and brochures that explain safety procedures and common concerns should be made available to all patients. Author also suggested the need for more monitoring of regulatory bodies. (37)

Further Cross-sectional study had done on 100 patients (55 female, 45 male) at Kufa University, Iraq to assess Patients' awareness of Cancer Risk from Radiation in Computerized Tomography. The study shows the radiation's risk issue needs to be taken seriously and urgent actions with dedicated programs are recommended to educate patients (mainly by media) and to establish a reasonable patient-informing system. It shows majority (86%) of patients have no any awareness about the high radiation dose implied to the patient by CT, while only 18% (18 patients) have adequate awareness. About 63% of the study groups were not informed about risk from CT radiation neither by referring medical personnel. Female appeared to be more aware of high radiation dose (CT radiation) risk than male. This study recommended the necessity of further large-sample studies that assess awareness of patients as well as health care providers for that risk. (36)8

2.2 Significance of the study

For the last two decades, the world has observed advancement in technology of medical equipment. Together with the advancement of technology, the ionization radiation risks from xrays and gamma rays used in CT, PET, SPECT imaging and procedures become the concern of the treating physician, radiation associated workers and patients.

Knowledge about radiation associated risks and protective measures from medical imaging (radiographies) have been well studied in the rest of the world. Regarding knowledge, studies done so far in Ethiopia are a few. Even those studies which tried to assess the problem did not

consider patients' knowledge and do not indicate possible and convenient way of increasing our patients knowledge.

So, with recent progressively increasing introduction and use of advanced medical imaging technology in the country, Ethiopia, justifies the need for knowing the current level of knowledge of patients at the local as well as the national level. This is very important in designing the possible interventions.

This study will also contribute to the studies available on the subject matter and will serve as baseline for other researches.

Based on the findings of the study, at an institutional level, interventions could be taken.

The finding of the study could be also used to design similar interventions at the zonal, regional and national levels.9

Chapter Three: Objective

General objective:

 To assess patients' knowledge on ionizing radiation associated hazards and protective measures during medical imaging among patients waiting for diagnostic imaging and procedures in JUSH.

Specific objective:

 To assess knowledge of patients on imaging modalities using ionizing and nonionizing radiation (eg. x-ray, U/s MRI, CT etc..) among patients waiting for diagnostic imaging and procedures in JUSH.

 To assess knowledge of patients about radiation hazards among patients waiting for diagnostic imaging and procedures in JUSH.

 To assess knowledge of patients on preventive measures during medical imaging using ionizing radiation among patients waiting for diagnostic imaging and procedures in JUSH.

 To assess knowledge of patients on benefits of radiation among patients waiting for diagnostic imaging and procedures in JUSH.

 To assess the factors associated with poor knowledge of patients on radiation associated hazards and protective measures during medical imaging among patients waiting for diagnostic imaging and procedures in JUSH.10

Chapter Four: Methods and Material

4.1 Study Area and Study Period

This cross sectional hospital based study was conducted on patients waiting to have diagnostic imaging at radiology department , Jimma University Specialized Hospital (JUSH), from December, 25 2014 G.C to January, 25 2015 G.C. The hospital is the only referral hospital for over 15million people in the southwest Ethiopia (JUSH archive, 2000). JUSH located in Jimma Zone, Jimma town, Oromia region, south west Ethiopia which is at about 355Km from Addis Ababa. At the same time it is a teaching hospital with various other public health services.

The radiology department is one of the busiest working areas. It gives services for all patients referred from different specialty departments, OPD and ward admitted patients. There are two xray machines, one fluoroscopy and three functional ultrasounds (one Doppler ultrasound) in the department.

Approximately More than 20,000 thousands of patients referred to this department for imaging per year which means around 1660 patients per month and about 60 patients per day.

4.2 Study design

A cross sectional hospital based study was conducted.

4.3 Population

4.3.1Source population

All patients who referred to the radiology department for diagnostic radiologic imaging.

4.3.2 Study population

All patients referred for diagnostic imaging using ionizing radiation full filling the inclusion criteria and volunteer for participation were included until the sample size was met.(388 in this study)

4.4 Eligibility criteria

4.4.1 Inclusion criteria

Any patients referred for diagnostic imaging using ionizing radiation is taken eligible for the study provided that he/she is willing to be enrolled.

4.4.2 Exclusion criteria

Critically ill, emergency cases and psychotic patients were excluded as they need prompt care. A patient who is not convenient for communications on interview like child, speech disability was excluded. Additionally patient who referred for second time over study time and non respondents were exempted.11

4.5 Sample size determination and sampling technique

4.5.1 Sample size determination

The minimum sample size needed for the study was calculated by using the single population proportion formula of calculating the minimum sample size. 95% confidence interval assumption will also be used.

The sample size was calculated using the formula

n = Z 2 p (1-p) / w2 where:

n= the minimum sample size required

Z=the normal standard score corresponding to 95% CI=1.96

P=proportion of responding knew and aware ≈40% from previous study (37)

W=degree of accuracy required

So, n = (1.96) (1.96) (0.4) (0.6) / (0.05) (0.05) = 369

With 5% approximation of non-respondents for calculated value, the study sample included 388 individual.

4.5.2 Sampling technique

A convenient sampling technique was used including all eligible participants until the required total sample size was achieved.

4.6. Data collection procedures (Variables, Instrument, personnel, data quality control)

4.6.1 Study Variables

Patients' knowledge On ionizing radiation hazard, protection measures and application of radiation, back ground radiation hazard, radiation symbol, Age, sex, Level of education, employment, places of residences, ethnicity, and religion.

4.6.2 Data collection Instrument

A structured English, Amharic and Afan Oromo language version questionnaire addressing the socio demographic characteristics, age, sex educational level etc. and questions which assess the patients' knowledge on radiation associated hazard, protective measures and radiation applications were used to collect data.

4.6.3 Data collection personnel

For data collection, two individuals from department hired for the study period. One day demonstration were given for the data collectors on how to proceed with the study, detail explanation of questionnaires, meaning of medical terminologies and ideas to be addressed for patient under interview and how to fill the questionnaire before data collection was started. Orientation was also be given to the data collectors on how to retrieve important information for completeness of questioner from the patient under study. The investigator supervised & followed

the data collectors intermittently during the study period.12

4.6.4 Data collection technique

Data were collected by using structured questionnaires, interviewing the patient waiting for diagnostic radiological imaging before any intervention or procedure. The communication with the patient for the interview was conducted as much as possible by the language the patient understood well.

4.6.5 Data quality control

Prepared questioner was pre tested on other patients who were not part of the study before it was administered to actual study group. During the data collection procedure, the investigator was checked whether information was recorded correctly & completely. The collected data were checked for completeness, accuracy & clarity as well.

4.7 Data analysis procedures

Data was cleaned, edited and entered to SPSS version 20 for analysis. Distribution of variables was assessed using descriptive statistical analysis. In addition, parametric tests were performed Categorical variables were computed using the chi-square test for their association to examine differences between different patient groups in their responses to knowledge and awareness questions provided . P value of less than 0.05 was considered statistically significant.

4.8 Ethical Considerations

Ethical clearance was sought from Jimma University, College of Public health and Medical sciences Ethical Review Board and Radiology department. Everyone who referred for imaging has a full right to participate or refuse. Verbal and written consent for voluntariness of participation in the interview for data collection were obtained after informing all the patients being refusal will not affect the usual services they got from department. The result of the research will not affect the participants; it will be used for study and intervention will be done accordingly. Name will not be included in the data collection tool and all the information retrieved will be kept confidential between the data collector and the investigator. Patients with life threatening conditions were exempted from the study and were linked for appropriate care13

4. 9 Definitions

Absorbed dose: The amount of energy absorbed by irradiated matter per unit mass. This reflects the amount of energy deposited by ionizing radiation as it passes through a medium (such as air, water or living tissue) Unit: gray. Symbol: Gy.

ALARA: (AS LOW AS REASONABLY ACHIEVABLE): An optimization principle in

radiation protection used to keep individual, workplace and public doses as low as reasonably achievable, social and economic factors being taken into account. ALARA is not a dose limit; it is a practice that aims to keep dose levels low

Artificial radiation: Radiation created by human activities and that adds to naturally occurring background radiation.

Cosmic rays: A source of natural background radiation that originates in outer space

Deterministic effects: Changes in cells and tissues that are certain to occur after an acute dose of radiation (above a threshold value of at least 1000 mSv), below which the radiation effect is not detected.

Dose: A general term used to refer to the amount of energy absorbed by tissue from ionizing radiation

Ionizing radiation: A form of radiation that is capable of adding or removing electrons as it passes through matter (such as air, water, or living tissue). Examples are alpha particles, gamma rays, X-rays and neutrons

Natural background radiation: A constant source of radiation present in the environment and emitted from a variety of sources. These sources include ambient air (radon), terrestrial sources (radioactive elements in the soil), cosmic rays, and internal sources (food and drink).

Non-ionizing radiation: Radiation with lower energy than ionizing radiation; i.e., it does not possess enough energy to produce ions. Examples are visible light, infrared, and radio waves

Stochastic effects: A term used to group radiation-induced health effects (such as cancer or inheritable diseases) the probability of their occurrence increases proportionally with the radiation dose received: the higher the dose, the higher the probability of occurrence. The severity of the effect is not proportional to the dose.

4.11 Communication of Results

The result of this study was submitted to the department of Radiology ,Jimma University and its publication will be worked up on eventually.14

5 Chapter Five: Results

Socio-demographic characteristics

From the total of 388 samples only 2 individuals were found not willing to participate in the interview, making the response rate 99.5%.

Responses from the survey reveals that 225(58.3%) of the respondents were male while 161 (41.7%) were female. The age distribution range from 14years to 85years.The mean age for the

patient was 35 years and median 30 years. Age range of 20-29yrs accounts for maximum distribution,154 (39.9%).(Table 1).

The highest frequency distribution of education level belonged to primary school educated participants 164, (42.5%) and only 51(13.2%) had attended college and above. In contrary 24.1% had no formal education or no education at all.(Table 1).

Self-business employed patients 112(29%) frequency distribution was the highest among the employment category. Muslim religion followers, 260 (67.4%) were more frequent than the cumulative sum of other groups. The Oromo ethnic group frequencies the highest 263,(68.1%) followed by Amhara ethnic groups,70 (18.1%) among the respondents. (Table 1)15

Table 1. Socio-demographic characteristics of clients in radiology unit, JUSH, 2014G.C.

Variables Frequency(n) Percent (%)

Gender

Male

Female

225

161

58.3

41.7

Age

< 20 yrs

20-29yrs

30-39yrs

40-49yrs

>50yrs

51

154

73

56

52

13.2

39.9

18.9

14.5

13.5

Educational status

Illiterate/no education

Primary school(1-8)

Secondary school(9-12)

Collage and above

93

164

78

51

24.1

42.5

20.2

13.2

Employment

Official

Self-employed

House wife

Faemer

Student

Others

61

112

85

79

31

18

15.80

29.02

22.02

20.47

8.03

4.66

Religion

Orthodox

Protestant

Musilim

Others

72

52

260

2

18.7

13.5

67.4

0.5

Ethnicity

Oromo

Amhara

Kefa

Gurage

Others

263

70

30

10

13

68.1

18.1

7.8

2.6

3.416

Radiologic unit referral and information related to responses of clients

Regarding the current referral for diagnostic imaging unit the this survey statistical analysis showed 190(49.2%) of respondents were from internal medicine,141 (36.5%) from surgery,41(10.6%) from Gynecology and Obstetrics and 14(3.7%) of them were from the rest of departments . More than half of the respondents 197(51%) had had previous radiologic unit visit for imaging. According to their response 98(25.4%) of them had both x-ray and ultrasound. Additionally 69(17.9%) had x-ray and 30(7.8%) of them had ultrasound requests at least once. unfortunately no one of them reported another imaging like dental, CT, MRI, or Mammography imaging done for them.(Table 2). All the imaging unit referral were as per the recommendation of the ALARA and ICRP; no single self-request or for patient interest referral observed.(Table.2) Concerning the issue of the information sources about radiation less than half of the respondents, 109 (28.2%) had discussed about importance of imaging and likely associated harmful effects of radiation with referring physician. About half of the respondents 193(50%) had had education or back ground information on radiation hazard and protection methods from class, Television, Radios or other sources.(Table.2)17

Table 2. Radiologic unit referral and information related to characteristics of clients in JUSH 2015 G.C

Questions Frequency=n Percent (%)

Referring dept. for current imagining

Pediatric and child health

Internal medicine

Gyn-obs

Surgery

Ophthalmology

Others

1

190

41

141

8 5

0.3

49.2

10.6

36.5

2.1

1.3

Do patient had Previous radiologic unit referral.

Yes

No

197

189

51

49

Types of examination done on previous referral

X-ray(all types)

Ultrasound

Both

Other (specify)

69

30

98

0

17.9

7.8

25.4

0

Patient informed and advised about radiation issue

and their recent imaging referral by physician

YES

NO

109

277

28.2

71.8

Background information from class ,medias(Tv,

radio… etc)

YES

NO

193

193

50

5018

Knowledge about possible Radiation associated health hazards

There are numerous questions in different forms used in the questionnaire to assess the knowledge of the patients in depth among patients waiting for diagnostic imaging and procedures.(Table 3)

Among the knowledge questions, all participants (386) were asked for diagnostic imaging modalities. The majority of the participants, 356(92.2%) responded that they knew conventional x-ray. About 284(73.6%) of them were familiar with ultrasound and less than quartile, 32(8.3%) of the group aware about dental x-ray machine which was available for use. Twenty nine (7.5%) patients did not indicate any one of the equipment. (Table-3)

For knowledge on radiation health hazard only 203 (52.6%) patients indicated the association. Furthermore, the patients were asked about different imaging modalities and their radiation sources. More than half the them (63.7%) indicated radiography (x-ray) uses non ionizing radiation or they had no idea. Sixty five (16.8%) were incorrect in their assumption that ultrasound examinations involved the use of ionizing radiation, whereas 32 (8.3%) mistakenly thought that an MR study used ionizing radiation. Other important findings of the study were only 45(11.7%) of them show Computer tomography uses ionizing radiation and 314(88.3%) did not know about ionizing radiation used in CT (Table-3),

To further test their level of knowledge, respondents were asked to select which health problem resulted from the ionizing radiation exposure. Majority of the patients 152(39.4%) had indicated infertility followed by cancer, 130 (33.7%), only small percent of respondents indicate life span shortening hair losses and genetic anomalies.

Another question used to assess their knowledge was about highly radiation sensitive organ. Majority of the respondents had no idea. About 122(31.6%) of them indicate gonads as highly sensitive organ followed by kidney 27(7%) and only one patient indicate breast as highly

sensitive organ.

To assess their knowledge in more depth, the respondents were asked to select the Safe imaging modalities for pregnant mother (shown on table 3). Accordingly 32(8.3%) of patients selected ultrasound and 4 (1%) indicate MRI. Majority Of the patients 208(90.2%) had no idea.

The distribution frequency also indicates the number of patients indicating plain abdominal x-ray and CT as safe for pregnant mother account for 4(1%) and 5 (1.3%) respectively.

Another aspect of the patients' knowledge assessed was about Radiation hazard from back ground radiation the result was disappointing; more than 95% of the respondents had no idea.19

Table.3 knowledge about radiation associated health hazards among clients, JUSH,2015G,C.

Questions Frequency= n Percent (%)

Types of imaging modality patients knew (answering yes

I knew)

Conventional x-ray

Ultrasound

MRI

CT

Mammography

Dental x-ray

I don't know all

356

284

59

76

45

32

29

92.2

73.6

15.3

19.7

11.7

8.3

7.5

Have you heard of radiation related health hazards?

YES

NO

203

183

52.6

47.4

Which modality uses ionizing radiation (answering yes)

Radiography all type

Ultrasound

MRI

CT

No idea

140

65

32

45

244

36.3

16.8

8.3

11.7

63.2

knowledge of patient on which organ highly Radiation

sensitive

Thyroid

Breast

Kidney

Gonads

No idea

5 1

27

122

231

1.3

0.3

7.0

31.6

59.8

Knowledge on Safe imaging modalities for pregnant

(indicating yes)

Plain abdominal x-ray

Ultrasound

MRI

CT

No idea

4

32

4 5

348

1

8.3

1

1.3

90.2

Knowledge on possible health hazards caused by radiation

(indicating yes I knew)

Infertility

Life shortening

Hair loss

Cataract

Genetic/fatal anomaly

Cancer

No idea

152

21

17

54

10

130

208

39.4

5.4

4.4

14.0

2.3

33.7

53.9

Environmental back ground radiation associated possible

health hazard knowledge or information

YES

NO

19

369

4.9

95.120

Knowledge about protective measures and Ionizing radiation applications

Responses of patients for additional questions used to assess knowledge on protective measures showed on table 4. The number of patients who knew radiation protection symbol was only 15 (3.9%).

A large number of patients 292 (75.6%) responded that they had no idea about protective measures or precaution while diagnostic imaging or procedures. 85(22%) of the patient indicate not entering to examination room without indication and, 41(10.6%) indicate covering the sensitive body part with lead (pb) help for protection from radiation exposure. Another important point which need take attention was their thought that wearing thick clothes protects radiation

exposure indicated by 15(3.6%) patients.

One additional interesting result was Only 55(14.2%) of the patients was agree with the recommendation for repetition of imaging being unjustified with ionizing radiation.

Further question to assess patients' knowledge on application of the ionizing radiation other than diagnostic imaging asked. Most of (96.1%) the patients had no idea. In general, the respondents knowledge for this question relatively very poor. Ten (2.6%) of them indicate radiotherapy, 6(1.6%) lithotripsy and one patient reported application of radiation in security.(Table 4)21

Table 4. Knowledge about protective measures and Ionizing radiation applications other than imaging among clients in JUSH, 2015G,C.

Questions. Frequency= n Percent (%)

Do you know Radiation protection symbol?

YES

NO

15

371

3.9

96.1

Knowledge on Protective measures for radiation

No idea

Cover sensitive part lead(pb)

Prefer x-ray with small rad. Dose or no rad.

Wear thick cloth

Do not enter exam. Room

Do not support patient without pb cover

292

41

33

14

85

25

75.6

10.6

8.5

3.6

22

6.5

Importance of Knowledge about hazard of radiation and protective measure while diagnostic imaging.

Very important

Moderately important

Not really important

Not important

No idea

328

9 1 2

46

85.0

2.3

0.3

0.5

11.9

Repetitions of unjustified imaging recommended

YES

NO

55

331

14.2

85.8

Patients knowledge on Ionizing radiation application other than imaging

NO idea

Radiotherapy

Energy and light

Lithotripsy

security

Another application

371

10

1 6 1 0

96.1

2.6

0.3

1.6

0.3

022

Influencing factors for Knowledge about radiation

Further data analysis was done by Chi-square tests to detect relationship between categorical data with statistical package for social sciences (SPSS) version 16. For this purpose the variables, Age, sex, educational level, occupation, previous imaging unit referral and about radiation information from physician or background (classes, media..Etc), were used to look at their association with patients knowledge about possible radiation associated hazards, protection measures and applications of radiation beside use in diagnostic imaging.

Accordingly the cross tabulation was done to assess variables which has potential to affect patients knowledge on radiation associated health hazards. (Table 5 shows the result).

The educational level, occupation, previous imaging unit referral and being informed by physician or having back ground information all had highly significant association with patients' knowledge on radiation associated health hazards. (p=001). The result shows the clients' responses were affected both across the same group and among different educational levels. For example the number of patients who knew that radiation associated health hazards vs did not know across the college and above group is 20.2% vs 5.5%.Additionaly the ratio across primary level were 5.3% to 44.4%. This show education was positively influenced their knowledge about radiation, i.e being became high level in education their knowledge on radiation health risks increases. An official and self- employed had better response than the member in the groups. An individual with previous referral to the imaging unit were much better than the one with no previous referral (60.6% vs 39.4) on indicating radiation health hazard. Patients with back ground information

from classes, medias…etc had good knowledge on health hazard of radiation (88.7% Vs 11.3%) The difference among the patients, being the patient advised and information about the radiation delivered by treating physician, their tendency to identify as radiation is harmful for healthy increased.(5.5% vs 94.5%).In general education or information on radiation issue has an influence.23

Table 5. Influencing factors for patients knowledge about radiation associated healthy hazards among clients in JUSH, 2015G,C.

Knowledge about radiation associated health hazards

P

Yes No

Age of patients Below 20 yrs 33(16.3%) 18(9.8%)

0.10

21-30 yrs 85(41.9%) 69(37.7%)

31-40 yrs 39(19.2%) 34(18.6%)

41-50 yrs 24(11.8%) 32(17.5%)

Above 50 yrs 22(10.8%) 30(16.4%)

Sex Male 119(58.6%) 106(57.9%)

0.89

Female 84(14.4%) 77(42.1%)

Educational level No education at all 25(12.3%) 68(37.2%)

Primary school 79(38.9%) 85(46.4%) 0.001

High school 58(28.6%) 20(10.9%)

College and above 41(20.2%) 10(5.5%)

occupation Official 48(32.6%) 13(7.1%)

0.001

self-employed 75(36.9%) 37(20.0%)

Housewife 32(15.8%) 53(29.0%)

Farmer 24(11.8%) 55(30.1%)

Student 19(9.4%) 12(6.6%)

Others 5(2.5%) 13(7.1%)

Previous information

on radiation from

edu, medias etc.

Yes 180(88.7%) 13(7.1%)

No 23(11.3%) 170(92.9%) 0.001

Previous referral for

imaging

Yes 123(60.6%) 74(40.4%)

0.001

No 80(39.4%) 109(59.6%)

Information/advise

from physician

Yes 99(48.8%) 10(5.5%)

0.001

No 104(51.2%) 173(94.5%)24

Another Chi-square cross tabulation result (Table.6) for patients knowledge on radiation symbol shows education, occupation , background information and information from the physician has an association with p value of, 0.001,0.001,0.004,and 0.001 respectively.

Additional chi-square cross tabulation (Table 7) to assess an association of Knowledge on background radiation associated health hazards with similar variables were done. The result showed occupation educational level, having back ground information and being information delivered by physician had significant association with p value of 0.001, 0.001, 0.02, and 0.001respectivily.The knowledge on radiation sources for different imaging modality and the highly radiation sensitive organ response knowledge of the patient was one with significantly association with educational level, occupation being having information and having pervious referral. (p=001)

Further parametric tests were performed for specific radiation health risks. The results showed significance of their association between knowledge on radiation health hazards can cause genetic abnormality, infertility, hair loss and variables, occupation ,educational levels, back ground information on radiation and information from physician (for all $p< 0.05$).There is no association indentified for the patient knowledge on modalities which is safe for pregnant mother and radiation associated health risk specifically, cancer. this could be as result of most respond ants for this were from primary school.25

Table 6. Influencing factors on patient's knowledge about radiation protection symbol among

clients in JUSH,2015G,C.

Patient who know Radiation protection symbol P

Yes No

Age of patients Below 20 2(13.3%) 49(13.2%)

0.929

21-30 6(40.0%) 148(39.9%)

31-40 3 (20.0%) 70(18.9%)

41-50 3 (20.0%) 53(14.3%)

Above 50 1(6.7%) 51(13.7%)

Sex Male 11(73.3%) 214(57.7%)

Female 4(26.7%) 157(42.3%) 0.23

Educational level No education at all 1(6.7%) 92(24.8%)

0.001

Primary school 1(6.7%) 163(43.9%)

High school 7(46.7%) 71(19.1%)

College and above 6(40.0%) 45(12.1%)

occupation Official/employed 9(60.0%) 52(14.0%)

0.001

self-employed 3(20.0%) 109(29.4%)

Housewife 0 85(22.9%)

Farmer 1(6.7%) 78(21.0%)

Student 1(6.7%) 30(8.1%)

Others 1(6.7%) 17(4.6%)

Previous information

on radiation from edu.

medias etc.

Yes 13(86.7%) 180(48.5%)

No 2(13.3) 191(51.5%) 0.004

Previous referral for

imaging

Yes 12(80.0%) 185(49.9%)

0.22

No 3(20.0%) 186(50.1%)

Information/advise

from physician

Yes 11(73.3%) 98(26.4%)

0.001

No 4(26.7%) 273(73.6%)26

Table. 7 Influencing factors on patients' knowledge about background radiation associated health hazards with different variables. JUSH, 2015G, C.

Back ground radiation associated health hazards

knowledge. P

Yes No

Age of patients Below 20 2(10.5%) 49(13.4%)

0.31

21-30 7(38.8%) 147(40.1%)

31-40 7(38.8%) 66(18.0%)

41-50 2(10.5%) 54(14.7%)

Above 50 1(5.3%) 51(13.9%)

Sex Male

14(73.7%) 211(57.5%)

Female 5(26.3%) 156(42.5%) 0.16

Educational level No education at all 1(5.3%) 92(25.1%)

0.001

Primary school 1(5.3%) 163(44.4%)

High school 7(36.8%) 71(19.3%)

College and above 10(52.6%) 41(11.2%)

occupation official/employed 10(52.6%) 51(13.9%)

0.001

self-employed 4(21.1%) 108(29.4%)

Housewife 1(5.3%) 84(22.9%)

Farmer 2(10.5%) 77(21.0%)

Student 2(10.5%) 29(7.8%)

Others 0 18(4.9%)

Previous information

on radiation from

class, medias etc.

Yes 16(84.2%) 177(48.2%)

No 3(15.8%) 190(51.8%) 0.02

Previous referral for

imaging

Yes 12(63.2%) 185(50.4%)

0.28

No 7(36.8%) 182(49.6%)

Information/advise

from physician

Yes 12(63.2%) 97(26.4%)

0.001

No 7(36.8%) 270(73.6%)27

Table 8 Comparison of the incorrect answers of the previous studies which asked if MRI/US use ionizing radiation.JUSH,2015 G.C

An authors/country(reference) Ultrasound(%) MRI (%)

Shiralkeret.al,2003 (25) 5 8

Jacob et.al,2004 (28) 10 28

Turky (34) 58.9 44.6

Addis Ababa university. Daniel (33) 5.3 7.1

Hong kong (38) 32.7 60.7

**** JUSH **** 16.8 8.328

6. Chapter six: Discussion

This hospital based cross sectional study planned to assess the patients' knowledge about radiation. In general, the results of the current study in JUSH are similar to the findings of previous studies in the literature and indicate a similar lack of knowledge among patents regarding knowledge on the possible hazards of examinations with ionizing radiation protective measures and applications of radiation. (25,28,34-39) This lack of knowledge of radiological issues in current study was evident with results clearly. From the survey radiation associated health hazard indicate only by 203 (52.6%) patients which is against to the ALARA principle

and ICRT recommendations. (19,20) . This percentage is in fact considerably good compared to other studies. The study from Medical and Geriatric Department, Kwong Wah Hospital, Hong Kong, China indicate about 87.9% of patients were aware of the radiation risk from plain Xrays,(38) another study from ugand, kampala show 43% patients say x-ray dangerous and 15% no idea.(39) Similarly study from Nigeria indicate only 13.0% of the patients were aware dangers of ionizing radiation.(37) Additional study from Iraq showed only 18% patients have adequate awareness on radiation issues from imaging spatially CT.(36)

Many diagnostic ionizing procedures that are performed every day can potentially expose both patients and the medical staff to high levels of radiation, and this may cause negative health effects on the human body(18) Furthermore, patients should have the ability to differentiate and compare the radiation sources that are associated with the various medical imaging modalities and to express the benefit and risks with each modalities. This not only has proven useful studies but is important in helping patients and their families to understand the relative risks and adjusting their preferences and acceptance of their physician advises. (20)

Our results showed that all of the referral were by physician, no self-request report identified. These findings would seem to support those of the ICRP reports, which indicated radiological examinations should be ordered with adequate justification.(20)

This study also attempts to assess the patents knowledge about imaging modalities. The majority of the participants, 356(92.2%) responded that they knew conventional x-ray. About 284(73.6%) of them were familiar with ultrasound and 29(7.5%) of the patient did not indicate any one of the equipment.29

Knowledge of the public's overall exposure to ionizing radiation is another important aspect of their health care. More than half them (63.7%) indicated radiography (x-ray) uses non ionizing radiation or they had no idea. Sixty five (16.8%) were incorrect in their assumption that ultrasound examinations involved the use of ionizing radiation, whereas 32 (8.3%) mistakenly thought that an MR study used ionizing radiation. This study also revealed only 45(11.7%) of patients show Computer tomography uses ionizing radiation. The majority of the patient 314(88.3%) did not know about ionizing radiation used in CT. The literature indicates similar lack of knowledge on this issue. The study from turkey indicated 68.3% of patients knew that radiography use x-ray. Additionally 44.6% of them also believed MRI uses x-ray and 58.9% of them did not aware radiation free nature of ultrasound..While 20.5% of them knew that CT contained more x-ray similar to our result.(34) study from Hong kong china indicated about

60.7% and 32.7% were not aware of the radiation-free nature of MRI and USG, respectively.(38) When the physicians' knowledge about US and MRI was compared with our patients', In this study who were mostly primary school educated, by average the frequencies of our study were good and encouraging.(25,28,33,40) this result could be explained by as outcome of physician advises, previous referral, back ground information from medias. (see table 8 for comparisons on U/S and MRI ionizing free nature of different authors)

An attempt was also made to assess patients' radiation health risk knowledge. Majority of them (39.4%) perceived that infertility could be seen as adverse effects of ionizing radiation followed by cancer, 33.7%, only small percent of respondents indicate life span shortening hair losses and genetic anomalies. From similar study in Turkey Many of patients knew that x-ray could cause cancer (73.2%) and fetal anomaly (69.2%). This result by far better than our. Our result suggests that patients' awareness about specific health risk associated ionizing radiation was not satisfactory; more than 50% of the respondent had no idea. It could be explained by majority of respondent were from primary school and information gap generally about cancer ,The author also indicated the value of media in their set up.

Regarding the highly radiation sensitive organ majority of the respondent indicate they had no idea, and 31.6% of them indicated gonads.

Additionally this study try to assess the patients knowledge on back ground radiation associated hazards; majority (95%) of them had no idea. Similar to this result study from Mulago Hospital,30 Kampala, Uganda show all patient had no idea. Another study from Hong kong china show 34% were not aware about back ground radiation risk.

Only 3.9% of our patient indicated radiation protection symbol and large (75.6%) number of our patients had no idea how to protect themselves from radiation. 3.6% of patients indicated thick cloth could protect them. Study from Uganda Kampala similarly showed 83.3% of the patients had no idea on how to protect themselves from radiation and 95.7% of patient had no idea about radiation symbol. Further study from turkey indicates 22.3% of patients declaring that thick cloths could protect them from harmful effects of x-ray.

Study from turkey indicated conventional radiography (72.8%) and CT (71.4%) were harmless during pregnancy. Additionally 33.5% of them also believed MRI uses x-ray and 66.5% avoided this examination during pregnancy. From our study Majority Of the patients 208(90.2%) had no idea. 32(8.3%) of patients selected ultrasound and 4 (1%) indicate MRI for use in pregnancy. Additionally plain abdominal x-ray and CT as safe for pregnant mother indicated in 4(1%) and 5

(1.3%) respectively. Our studies result shows better outcome. Patients' knowledge gap which might improve with education and delivering information for them.

In practice, patients believe that good doctor orders many examinations, including radiologic ones and prescripts many medicines. ALARA (as low as reasonably achievable) principles have been the standard in the radiology community for many years and are best applicable in the field of medical radiologic practices. The principle is very easy to understand and should be always kept in mind among physicians and also patients. Patients could protect themselves from unnecessary radiological examinations and ionizing radiation exposure. In current study only 14.2% patient support and agree with the repetition of the diagnostic imaging using ionization radiation. This shows us promising result of our patients' knowledge. Majority of the patient indicate importance of information on radiation hazard and protective measure.

Today, to benefit humankind, radiation is used in medicine, academics, and industry, as well as for generating electricity and energy. In addition, radiation has useful applications in such areas as agriculture, archaeology (carbon dating), space exploration, geology (including mining) as well as material analysis(security)and many others.(6)Concerning the application radiation beside imaging majority (96.1%) of the patient had no idea . Ten- individual indicate radiotherapy, 6- lithotripsy, 1- energy and light and 1- individual in security use31

Further parametric tests Chi- square cross tabulation were performed to look for association of different variables with patients knowledge. Educational level, occupation, previous imaging unit referral and being informed by physician or having back ground information all had highly significant association on patients' knowledge on possible radiation health hazards was (p=001). Additional chi square test computed for knowledge on ionizing radiation sources for ultrasound and MRI, radiation organ sensitivity, radiation protection symbol, back ground radiation associated health risks and safe imaging modality in pregnancy with similar variables as above. All of the result indicate an association ($p<0.05$).On parametric evolution for association of patients knowledge on application of radiation with chi- square test no variables identified this could indicate some confounding factors or issues like most of the client included in study were from primary school.32

7. Chapter Seven: Conclusion and Recommendations

7.1 Conclusion

In conclusion, this hospital based cross sectional study clearly indicate the inadequacy of patients knowledge on radiation issues in general agreement with the results of other surveys done in

different areas of the worlds. According to this survey

 knowledge of patients on different imaging modalities using ionizing and non- ionizing radiation were poor which definitely influences their confidence and accepting ordered imaging.

 Knowledge of patients about possible radiation associated healthy hazards was not adequate.

 Knowledge of patients on preventive measures during medical imaging using ionizing radiation was very poor.

 All most all of the patients had no an idea that the ionizing radiation benefits in multidisciplinary fields like industrial, security, researches, therapeutic---- etc.

 This study reveals education and information about radiation issue was the most important factor for increasing or influencing patients' knowledge about radiation issue.

 Despite all the referral for imaging were done by the treating physicians, they were not advising and delivering adequate information on radiation issue , Only 28.2% of the patient indicated that they were advised and information delivered for them .33

7.2 Recommendations

 Jimma university specialized hospital is a teaching hospital and Jimma University is top concerned with community based work with slogan "we are in the community" ; with this fact filling this identified knowledge gap should be an assignment for both JUSH and Jimma University Public health and Medical Science College.

 Health promotion program should work on the line of improving the community knowledge as the study sample was the representative from the community.

 Radiation workers (radiologists, radiology technician or technologists, Radiotherapists) should have discuss and deliver up to dated information on radiation hazard & safety before they start working with ionizing radiation.

 This study emphasizes the need for all physicians to equip themselves with current and appropriate information about ionizing and non-ionizing radiation and deliver adequate advises and information while referring patient for imaging. (information affects patients knowledge about radiation)

 National Radiology Community, JUSH and Radiology Department have responsibility to publish and deliver informative brochures, leaflets, posters and important written papers (image of different imaging modalities, radiation protection symbol,

recommendations …etc).

- Government should encourage the courses on radiation issue and should be given at the primary school level. Additionally Medias should broad cast intermittently on their health programs.
- There is a need for further research to assess the level of radiological knowledge among health professionals to have more solid information on the issue.
- Finally, qualitative study should be done to explore in depth the factors contributing to patients' lack of knowledge, and their preferred method for learning or possible way through which adequate information about radiation easily delivered for them.34

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ANNEX I: QUESTIONAIRE

I- Questions Related Socio Demographic Status

1. Age……

2. Gender A. Male B. Female

3. Educational status

A. Illiterate/ No education at all

B. Primary school(grade 1-8)

C. High school(grade 9-12)

D. College and above

4. Employment

A. Office Worker/ both governmental and non-governmental

B. Self-employed

C. House wife

D. Farmer

E. Student

F. Others

5. Religion A. orthodox B. protestant C. Muslim D. others (specify……)

6. Ethnicity A. Oromo B. Amhara C. Kefa D. Gurage E. others (specify…)

II-Questions Related To Knowledge on Ionizing Radition Hazards and Protection measures.

7. From which department you referred?

A. pediatric and child health B. Internal medicine C. Gyn-obs C. Surgery

D. Ophthalmology E. Others

8. Do you have previous radiologic unit referral for examination?

A. Yes B. No

9. If your answer for no.8 is yes what examination or procedure done?

A. x-ray (all types) B. ultrasound C. Others…… D . both A and B

10. Please mark the types of imaging modality you know. (You can mark more than one)

A. Conventional x-ray B. ultrasound C. MRI D. CT E. mammography

F. Dental X-ray G. others38

11. Your current radiologic examination is on the request of: A. Physician B. Self- request

12. Is X-ray harmful? A. Yes B. No C. No idea

13. Do your doctor told you the importance of your current imaging and likely associated harmful effects ? A. Yes B. No

14. If it is self- request, please explain why you preferred the examination……..

15. Have you had education or back ground information on radiation protection? (Courses, TV or radio etc?)

A. Yes B. No

16. Which imaging modality use ionizing radiation? (You can mark more than one)

A. Radiography (chest x-ray fluoroscopy, plain abdominal x-ray, dental x-ray, mammography) B. Ultrasonography C. MRI D. CT E. Others G. No Idea

17. Among the following organs one is highly sensitive to radiation?

A. Thyroid B. Breast C. Kidney .D Gonads E. No idea F. other

18. Which of the following could be used safely for pregnant women? (You can mark more than one) A. . Plain abdominal x-ray B. Ultrasonography C. MRI D. CT E. No idea

19. Do you now that health hazard could be caused by radiation exposure used for imaging investigation? A. Yes B. No

20. which of the following could be health hazard caused by radiation exposure? (You can mark more than one)

A. Infertility

B. Life shortening

C. Hair loss

D. Cataract

E. Genetic disorders/fatal anomalies

F. Cancer

G. No idea39

21. Do you now background radiation? A. Yes B. No C. No idea

22. Do you know symbol for radiation protection which indicate area where radiation emitting Sources Located? A. Yes B. No

23. Which of the following should be done for protection from harmful effects of x-ray? (you can mark more than one)

A. Cover the sensitive areas with lead (Pb)

B. Doing the examination contain lesser x-ray or no x- ray.

C. Wearing thicker clothes.

D. Do not inter & stay in the examination room unnecessarily

E. Don't support patient on examination without lead apron.

F. No idea

24. How important do you think is the need of knowledge of ionizing radiation exposure risks and protective measure from common radiological investigation?

A. Very important

B. Moderately important

C. Not really important

D. Not important at all

E. No idea

25. Do you think that repetition of imaging using ionizing radiation recommended?

A. yes B. No.

26. what are areas of application of radiation, Other than for imaging uses?

……..

Thank you!!!!!!

Data collector…… Sign……date……40

Annex II: በአማረኛ የተዘጋጀ መጠይቅ

ሀ. ሰሞኑ ሕመምተኛዉ አጠቃሊይ ሁኔታ ሇማወቅ የተዘጋጀ መጠይቅ፡፡

1. እዴሜ .....

2. ፆታ ሀ. ወንዴ ሇ. ሴት

3. የትምህርት ዯረጃ

ሀ. ማንበብና እና መፃፍ የማይችለ ሇ. አንዯኛ ዯረጃ(1-8) ሐ. ሁሇተኛ ዯረጃ (9-12)

መ. ኮላጅ እና ከዚያ በሊይ

4. የሥራ ሁኔታ ሀ. የቢሮ ሥራተኛ ሇ. የግሌ ሥራ ሐ. የቤት እመቤት መ. ግብረና ሥራ

ሠ. ተማረ ረ. ላሊ (ግሇፅ)…….

5. እምነት ሀ. አርቶድክስ ሇ. ፕሮቴስታንት ሐ. ሙስሉም መ ላሊ(ግሇፅ)……

6. ብሔር ሀ. ኦሮሞ ሇ. አማራ ሐ. ከፋ መ.ጉራጌ ሠ. ላሊ(ግሇፅ)……

ሇ. ሕመምተኞች ሰሇ ጨረር ያሊቸዉን ዕዉቀት ሇመገምገም የተዘጋጁ ጥያቄዎች፡፡

7. ከየትኛው የሕኪምና ከፍሌ ነው የተሊኩት ?

ሀ. ከሕፃናት ሇ. ከውስጥ ዯዌ ሐ. ከማህፀን እና ከፅንስ መ. ከቀድ ሕክምና

ሠ. ከአይን ረ. ላሊ(ግሇፅ)…….

8. ከአሁን በፊት ወዯ ራጅ ምርመራ ክፍሌ ሇምርመራ ተሌከው ያውቃለ?

ሀ. አዎ ሇ አሊዉቅም

9. ሇተራ ቁጥር 8 መሌስዎት አዎ ከሆነ የታዘዘሇዎት/ሌህ /ሽ ምርመራ

ሀ. ራጅ (ሁለም አይነት) ሇ . አሌትራሳውንዴ ሐ ላሊ…….. መ. ሀ እና ሇ

10. ከሚከተለት ውስጥ የትኛውን የምርመራ መሣሪያ ያውቃለ ?

ሀ . የራጅ መመሪመሪያ (conventional x-ray machine) ሇ. አሌትራሳውንዴ ሐ. MRI

መ. CT ሠ. የጡት መመርመሪያ ራጅ (mammography) ረ. የጥረስ ሰ. ላሊ (ግሇፅ)……

11. የአሁኑ ምረመራ የታዘዘሌዎት

ሀ. በሐኪምዎት ትዕዛዝ ሇ. በራስዎት ፍሊጎት

12. ጨረር ወይም (x-ray) ጎጂ ነው ቢሇዉ ያሲባለ ? ሀ. አዎ ሇ. አይዯሇም ሐ. አሊዉቅም

13. ሰሞ ምርመራዎት አስፇሊጊነት እና ከምርመራ ጋር ተጓዯኝነት ሉኖረ ሰሇሚችሌ የጨረር ችግር ሐኪሞዎት ነግሮታሌ ? ሀ. አዎ ሇ. አሌተነገረኝም

14. ምርመራው በራስዎት ፍሊጎት ጠይቀዉ የታዘዘሇዎት ከሆነ ሇምን እንዯፇሇጉ ያስረደን፡----------

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15. ሰሞ ጨረር ከረዱዮ ከቴላቭሽን እንዱሁም ከትምህርት ቤት ወይም ከማንኛውም ቦታ የሰሙት ወይም ያገኙት እውቀት አሇ ?

ሀ.አዎ ሇ. የሇም41

16. ከሚከተለት ውስጥ የትኛውን ምርመራ መሣሪያ ጎጂ የሆነ የጨረርአይነት (ionizing) ይጠቀማሌ ? (ከአንዴ በሊይ መምረጥ

ይቻሊሌ)

ሀ .ማንኛውም የራጅ መመሪመሪያ (x-ray) ሇ. አሌትራሳውንዴ ሏ. MRI መ. CT

ሠ.ላሊ(ግሇፅ)..... ረ. ሰሇሚህ ጉዲይ ምንም አሊዉቅም

17. ከሚከተለት የአካሊችን ክፍሌ የትኛው በቀሊለ በራጅ ጨረር ሉነዲ ይችሇሌ ?

ሀ. እንቅርት ሇ. ጡት ሏ. ኩሊሉት መ. የዘር ፍሬ ሠ. አሊውቀም ረ. ላሊ(ግሇፅ).....

18. ሇእርጉዝ ሴቶች ያሇምንም ጉዲት የምንጠቀምበት የመመርመሪያ መሣሪያ የቱ ነዉ ብሇዉ ያሰባለ? (ከአንዴ በሊይ መምረጥ ይቻሊሌ)

ሀ. . የራጅ መመሪመሪያ (x-ray) ሇ. አሌትራሳውንዴ ሏ. MRI መ.CT ሠ.አሊውቀም

19. የራጅ ጨረር የጤና ችግር ሌያሰከትሌ እንዯሚችሌ ያዉቃለ ? ሀ. አዎ ሇ. አሊውቀም

20. ሇራጅ ጨረር ከመጋሇጥ ጋር ተያያዥነት ሉኖረዉ የሚችሌ የጤና ችግር የትኛዉ ነዉ ? (ከአንዴ በሊይ መምረጥ ይቻሊሌ) ሀ. መሀንነት ሇ. የእዴሜ ማጠር ሏ. የፀጉር መሳሳት ወይም ማሇቅ መ. የአይን ችግር ሠ. የዘረመሌ ችግር(genetic abnormality) ረ.ካንሰረ ሰ. አሊዉቀም

21. በምንኖርበት ወይም በምንውሌበት በማንኛውም ቦታ ሇአዯገኛ ጨረር ሌንጋሇጥ እንዯምንችሌ ያውቃለ ? ሀ.አዎ ሇ.አሊውቀም

22. አዯገኛ ጨረር የሚያወጣ መሳሪያ ያሇበትን ቦታየሚያሳውቅ ምሌክት ምን እንዯሆነ ያውቃለ ?

ሀ. አዎ ሇ. አሊውቀም

23. በራጅ ምረመራ ወቅት ጨረርን ሇመከሊከሌ የሚዯረግ ተግባር የትኛዉ ነው ?(ከአንዴ በሊይ መምረጥ ይቻሊሌ)

ሀ. በቀሊለ በራጅ ጨረር ተጎጅ የሆነ የሕመምተኛዉን የሰውነትን ክፍሌ በሉዴ (pb) መሸፇን ሇ. ምርመራውን አነስተኛ ጨረር በሚጠቀም ወይም ጎጂ ጨረር በማይጠቀም መሣሪያ መተካት ሏ. በወፍራም ሌብስ መሸፇን

መ. የመመርመሪያ ቢታ ውስጥ ያሇሥራ አሇመግባት እና አሇመቆየት

ሠ. ሕመምተኛዉን ሇማገዝ ከተፇሇገ በሉዴ (pb) መሸፇን አሇበት::

ረ. ሰሇሚህ ጉዲይ ምንም አሇዉቀም

24. የራጅ ጨረር ጎጂነት እና የመከሊከያ ዘዳዎችን ማወቅ ምንያክሌ ያስፇሌጋሌ ብሇዉ ያምናለ ?

ሀ.በጣም ያስፇሌጋሌ ሇ.አስፇሊጊነቱ መካከሇኛ ነው ሏ ብዙም አያስፇሌግም

መ. ምንም አያስፇሌግም ሠ. ሰሇአስፇሊጊነቱ ምንም አሊውቀም

25. በተዯጋጋሚ ራጅ(x-ray) ምርመራ ማዴረግ ተገቢ ነው ብሇው ያስባለ ? ሀ. አዎ ሇ. አይዯሇም

26. ሇምረመራ ከመጠቀም ባሸገረ ጨረር ላሊ ጥቅም አሇዉ ቢል ያሰባለ?.....

ሇትብብረዎ አመሠግናሇሁ ::

ስም ----------ቀን ----------ፊሪማ-------42

Annex III: UNKAA GAAFFII KAN AFAAN OROOMOOTIIN QOPHA'EE

I- Gaaffilee Enyuumma Dhukabsataa Qorachuuf Qopha,Aan

1. Umurii.....

2. Saala A. dhiira B. dhalaa

3. Sadarkaa barnootaa

A. Kan barreessuffii dubisuu hin danddeenye

B. Sadarkaa tokkoffaa(1-8)

C. Sadarkaa lammaffaa(9-12)

D. Colleejjii fi isaa olii

4. Gosa hojii

A. Hojii biro

B. Hojii dhuunffaa

C. Haadha warraa

D. Qonnaan bulaa

E. Baarataa

F. Kan biraa

5. Amantaa A. Orthodoxii B. protistantii C. musilimaa D.kan biraa……

6. Gosa eeyyummaa

A. Oromoo B. Amaara C.kafaa D.Guragee E. Kan biraa…….

II. Gaaffilee Ogummaa Dhukubsatton Balaa Cararaa fi Tooftaa Ittisaa Cararaa Irratti Qabaan Qorachuuf Qopha'an.

7. Kutaa yaalaa kami irrraa dhuftanii?

A. kutaa da'imanii

B. kutaa yaalaa dhibee keessaa

C. kutaa yaalaa gadameessaa fi ultaa

D. kutaa baqaqsanii yaaluu

E. kutaa yaalaa ijaa

F kan biraa43

8. Kana dura gara mana cararaa(rajii) ergamtanii beektu?

A. Eeyyee B. lakkii

9. Yoo regamtanii beektu ta'ee qrannoo maaltu isniif godhamee?

a. X-ray (gosa hundaa) b. ultrasoundii c. kan biraa…. D. A fI B

10. Meshalee kutaa manaa qorannaa rajii beekttan Kannen armaan garii keessaa filadhaa (tokkoo ol filachuun ni danda,ama)

A. Meshaa x-ray B. ultasoundii C. MRI D. CT E. Mammography

F. dental x-ray G.kan biraa

11. qorannoon amma kun kan isinii(sii)ergamee

A. hakiimaan B. fedhaa dhukubsataan

12. X-rayn ykn cararrii balaa qabaa? A. Eyyee B. lakkii C. homaa hin beekuu

13. Hakiimni si ykn isin ergee barbaachisummaa fi walitii dhufeenyaa akkasuumaas balaa caraarrii qorannoo keessatii fayyadamnu qabuu isinifi ibsee jiraa?

A. Eeyyee B. lakkii

14. Yoo kan ofiin dhufan ta'ee maliif akka barbadan nuufibsaa……

…….

15. Kanan dura wa'ee cararaa ilaalchisee mana barumsaa ,radio, television akkasuman haaluma kamin kan dhageessan ykn wan barattan jiraa?

A. Eeyyee B. lakkii

16. Meshalee armmaan gadii keessa kan cararaa balaa hamaa qabu fayyadamuu filadhu.(tokko ol filachuun ni danda'ama)

A. X-ray gosa kamiyyuu B. ultrasaundii C. MRI D. CT E. Kan biraa--------

G. homaa hin beekuu wa'ee kanaa.

17. Kutaa qamaa armaan gadii keessa kan bayyee ykn salphattii cararaan midhamu filadhu.

A.Hucubaa B.Harmaa C. Kalee D qaama hormaataa

E. homaa hin beeku G. kan biraa……

18. Meshalee armmaan gadii keessa kan hadholii hulfaaf balaa tokko malee tajajiluu kamu?(tokkoo ol filachuun ni danda'ama)

A. X-RAY kan garaa B. ultrasoundii C. MRI D. CT E. Homaa hin beeku

19. Dhibeen fayyaa akka cararaa tajaajilaa (sakaittindaa) mana rajii keessatti fayyadamnu irra namaa qaqabuu danda'uu hubanno qabduu?

A. Eeyyee B. lakkii44

20. Dhibee fayyaa armaan gadii keessa kan cararaa manaa rajii keessattii fayyadamnuu waliin walitti dhufeenya qabuu kami? (tokkoo ol filachuun ni danda'ama)

A. Dhalaa dhabuu B. umurii gababachuu C. rifeensi namarraa dhumuu

D.dhibee ijaa

E. Dhibee genii F cancerii H. homaa hin beekuu wa'ee kana

21. Caraarri hamaan akka dirree(bakka) hundaa irra jiruu beektuu?

A. Eeyyee B. lakkii

22. Gara manaa rajii yeroo dhufttan malatto kutaa cararrii haman keessatti fayyadamamu agarsiisuu beektuu? A. Eeyyee B. lakkii

23. Kanneen armaan gadii keessa gochaan ittisa balaa cararaa hamaa hambisuuf ykn salphisuuf godhamu kami? (tokkoo ol filachuun ni danda'ama)

A. Qaama salphaatti cararan midhamuu danda'uu leedii(pb) itti hufisuu.

B. Meshaa qoranna cararaa xiqaa fayyadamuu ykn carara hin fayyadamnee filachuu.

C. Huccuu furdaa hufachuu.

D. Bakka qoranna callisanii seenuu dhisuu akkasumas keessa turuu dhiisuu.

E. Yoo dhukkubsataa gargaruun barbaadamee liidii fayyadamuu(pb).

F. Homaa hin beekuu.

24. Balaa cararrii nama irratii fiduufi toftaa ittin ofi ittisan beekuun hangam barbaachisaadhaa?

A. baayyee barbachisaa

B. Giddugaleessa

C. Hanganati mitii

D. Homaa hinbarbachisuu

E. Homaa hin beekuu

25. Dadabalanii sakata'iinsaa rajii gochuun barbachisuma qabaaykn itti amantuu?

A. Eeyyee B. lakkkii

26. Sakata'insa dhukkubaan cinattii cararrii fayidaa malii qaba jettani yaaddu?

…….

…….

GALATOMAA!!

Maqaa namaa qafii kanaa gutee ……malattoo…….guyyaa….45

የሕመምተኞች ፍቃዲኝነት መጠየቅያ ቅፅ

ይህ ቅፅ ወይም መጠይቅ ሕመምተኞች ሰሞ ጨረር ያሊቸዉን እዉቀት ሇመጥናት የተዘጋጀ ነዉ:: ጥናቱ ሇራጅ ምርመራ የተሊኩትን ሁለንም ሕመምተኞች የሚያጠቃሌሌ ነዉ::ጥናቱ ሇትምህርታዊ ምርምር መሞያ የተዘጋጀ ነዉ:: በተጨማሪም ዉጤቱ ሊይ በመሞረከዝ የራጅ ምረመራ ተጠቃም ሕብርተሰብ ሰሞጨረራ ያሊቸዉን ግንዛቤ ሇመጨመር አሰፇሊጊ እረምጃ በሚመሇከተዉ አካሌ የሚወሰዴ ይሆናሌ:: ፍቃዯኛ ያሌሆነ ሕመምተኛ ያሇመሣተፍ መብቱ የተጠበቀ ነዉ:: ማንኛዉም ሕመምተኛ ሇመሣተፍ ፍቃዯኛ በይሆንም ከክፍለ በሚያገኘዉ አገሌግልት ሊይ በቀጥታም ሆነ በተዘዋወር ምንም አይነት

ተዕኖ አያሣይረም::

1. ዉይ የተከበሩ ጥናቱ ሊይ ሇመሣተፍ ፍቃዯኛ ነዎት ?

ሀ. አዎ ሇ. ፍቃዯኛ አይዯሇሁም

አመሠግናሇሁ::46

Unka Fedhaa Itti Hirmaannan Qoranno Ittin Gaafatamuu.

Unkii gaaffii kun dukkubsattoonnii wayee" cararaa" ilalchisee hubanno ykn ogumma isaan qaban qorachuuf kan qopha'ee dha. Qorannan kun dhukubsatoota gara kutaa manaa cararaa (xray imaging room) ergaman hunda ilalataa.Qorannan kun itti guutinsa xumura barnoota ilaalchise kan qopha'ee; Haata'umalee firii bu'aa qorannoo kana irratti hunda'uudhaan qaamni dhimmi isaa ilaalatu hubannoo ykn ogumma fayyadamtootaa waayee cararaa irratti qaban guddisuufi murtee barbachisaa kan fudhatuu ta'a. Dhukkubsataan kam iyyuu qoranna kana irrattii hirmachuu dhiisufii mirga guutuu qaba.Qoranna kana irratii hirmachuu dhiisuun fayidaa fi tajaajilaa dhukubsataan kun kutaa yalaa kanaa irraa argatu halaa kamiin iyyuu kan hin hubnee dha.

A. Qoranna kana irratti hirmachuudhaaf fedhaa qabduu/aa?

A. Eyyee B. fedhaa koo mitii

Galatoomaa!!