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INFORMATION

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DOES PROPOLIS IMPROVE SPERM QUALITY IN PAROXETINE-INDUCED SEXUAL DYSFUNCTION IN MALE WISTAR RATS?

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ABSTRACT:
Propolis is a resinous product collected by honey bees for construction of hives. It is locally used as remedy for several ailments including various degrees of sexual dysfunctions. This study investigated the protective property of propolis in improving sperm quality in paroxetine-induced sexually impaired male Wistar rats. Forty-two male rats were divided into 7 groups of 6 rats each. Groups I (normal saline), II (administered paroxetine only for two weeks), III (Sildenafil), IV (low dose propolis), V (moderate dose propolis), VI (high dose propolis), and group VII (propolis+sildenafil). There was significant ($p< 0.05$) increase in sperm count in group VI, no significant ($p>0.05$) change in sperm count of group VII, but significant decrease in the other groups compared to control. There was significant ($p< 0.05$) reduction in sperm motility of rats in groups II, III, and IV, compared to significant ($p< 0.05$) increase in sperm motility of rats in groups VI and VII, but there was no significant ($p>0.05$) change in group V. The total sperm abnormality in groups II, III and IV showed significant ($p<0.05$) increase, while there was significant ($p<0.05$) reduction in sperm abnormality of groups VI and VII compared to control, and no significant ($p>0.05$) difference seen in group V. The plasma testosterone levels were significantly ($p<0.05$) reduced in groups II, III and IV, compared to significant ($p< 0.05$) increase in plasma testosterone level in groups VI and VII, but no significant ($p> 0.05$) difference in plasma testosterone in group V. The results indicate that high doses of propolis caused significant increase in plasma testosterone, and there was improvement in sperm count and motility as was obtained by the analysis of seminal fluid (SFA).

Keywords: Propolis, Sperm, Infertility, Sildenafil citrate, Paroxetine

INTRODUCTION:

Propolis is a natural brownish-green resinous substance produced by honey bees. Bees use propolis (PL) in making protective shield and filling of cracks of their hives, and also to polish the cells of the honeycomb [1]. PL is considered as one of the most promising natural products with capacity for treatment and prevention of myriads of health conditions [2]. PL is reported to have several pharmacological effects; as hepatoprotective, anti-inflammatory and antioxidant properties [3,4]. Sexual activity involves several aspects that are associated with complex interactions between neuroendocrine and vascular systems including a variety of structures that are instrumental to sexual excitement, intercourse and sexual pleasure [5,6]. Sexual dysfunction is a common side effect of some psychoactive medications as well as a number of other frequently prescribed drugs. Considerable attention has recently been focused on reproductive side effects of antidepressants, which are often taken for long duration; perhaps because they are usually under-reported by sufferers due to associated stigma [7]. Paroxetine is one of the Selective Serotonin Re-uptake Inhibitors (SSRIs) that are frequently prescribed for patients suffering from depression, anxiety or obsessive compulsive disorder. Common reproductive side effect of psychoactive drugs is a constellation of several entities described as sexual dysfunction which includes erectile dysfunction, decreased libido, delayed orgasm, and aspermia [8]. Sildenafil citrate is an oral medication considered to be first line therapy for erectile dysfunction. It is a specific Phosphodiesterase type-5 (PDE5) inhibitor that promotes penile erection by blocking the activity of PDE5 which causes cyclic-Guanosine Monophosphate (cGMP) to accumulate in the corpus cavernosum [9,10]. With the widespread increase in the use of antidepressants following increase in the prevalence of new cases of depression [11], and the consequent increase in antidepressant-induced infertility in males, especially due to affectations of semen parameters, it is pertinent to find appropriate medication that is natural, affordable, safe and easily available to manage this condition clinically. In view of the above, this this study was aimed at investigating the effects of propolis on the quality of semen in paroxetine-induced sexually impaired male Wistar rats.

METHODOLOGY:

Sexually potent male rats weighing between 140–190g, and equal number of sexually unexposed female rats weighing between 120-130g purchased from National Center for Research, Khartoum, Sudan were used for this study. They were housed separately and maintained in the animal house of the Faculty of Veterinary Medicine, University of Khartoum, Shambat, Sudan. They were kept in standard plastic cages containing wood chips (sawdust) bedding, with good ventilation, free access to

standard rat pellet feeds (National Center for Research) and water *ad libitum*. The animals were subjected to artificial day and night cycle of 12 hours by 12 hours light, under optimum temperature of 25-30^{o}C. The animals were acclamatised for two weeks prior to commencement of the experiment. The experimental protocols which involved invasive and non-invasive procedures were approved by the Animal Research Ethical Committee of the International University of Africa, Khartoum, Sudan, and were conducted in accordance with internationally accepted principle for laboratory animal use and care.

Propolis extract was a product of Organic Bee Farms Sheridan, Illinois (IL) Unites Stated of America (USA). It is commercially prepared as 1000mg per capsule and reconstituted by dissolving in 10ml of normal saline and delivered as 100mg/ml.

Paroxetine hydrochloride was a product of Pharaonia Pharmaceuticals, New Borg El-Arab City, Egypt. It was purchased at Hashmik Pharmacy in Khartoum Sudan. Ten milligram of the drug was dissolved in 10ml normal saline and delivered as 1mg/ml.

Sildenafil citrate (Viagra) was a product manufactured by Cadila Health Care Limited, Sharkhe-Bavla Ahmedabad India. It was purchased at the pharmacy outlet of the International University of Africa, Khartoum, Sudan. Twenty five milligram of the tablet was reconstituted in 10ml of normal saline and delivered as 2.5mg/ml.

Forty-two male rats were randomly distributed into seven groups containing six rats each; following administration of 10mg/kg of paroxetine for two weeks for induction of sexual dysfunction of groups II-VII as evident by loss of sexual behaviours, such as, mount and intromission frequencies [7]. The various treatments administered to the rats in the six experimental and control groups are presented in Table 1. The rats in Group I served as the general control and was maintained on 0.9% normal saline. Rats in Group II were given 10mg/kg of paroxetine and left untreated. Rats in Group III were given 25mg/kg of sildenafil in addition to 10mg/kg paroxetine. Rats in Group IV were given 50mg/kg of propolis (low dose) in addition to 10mg/kg paroxetine. Rats in Group V were given 100mg/kg of propolis (moderate dose) in addition to 10mg/kg of paroxetine. Rats in Group VI were given 200mg/kg of propolis (high dose) in addition to 10mg/kg of paroxetine. Rats in Group VII were given combination of 200mg/kg of Propolis and 25mg/kg of sildenafil in addition to 10mg/kg of paroxetine. The duration of the treatment was 60 days.

Table 1: Treatment administered to rats in the control and experimental groups

Groups of rats	Normal Saline solution	Paroxetine (PT) (mg/kg)	Sildenafil (SF) (mg/kg)	Propolis (PL) (mg/kg)
I	0.9%	0	0	0
II	0	10.0	0	0
III	0	10.0	25.0	0
IV	0	10.0	0	50.0
V	0	10.0	0	100.0
VI	0	10.0	0	200.0
VII	0	10.0	25.0	200.0

At the end of the experimental period, rats were sacrificed under ketamine anesthesia. An abdominal midline incision was made and extended to the chest to expose the heart. The apex of the heart was punctured with a needle and syringe. Blood sample was collected and poured into appropriately labeled heparinized blood collection tube. The tubes were centrifuged at 3000 rpm for 15 minutes to separate the plasma, which was then separated and stored appropriately till required for analysis. The quantitative determination of total testosterone concentration in plasma was done using Microplate Enzyme- linked Immunoassay (EIA) using Monobind assay kit (Lake Forest, USA) according to the manufacturer's instructions. Semen sample was obtained from the caudal region of the epididymis of each rat by carefully milking down the vas deferens. The sample was milked directly into a petrish dish already filled with diluent prepared from non-fatty milk powder (11%, w/v) and distilled water heated to 95°C for 10 min. After cooling to room temperature, penicillin (64.2mg) and streptomycin (100mg) were added at 37°C. Following this, the semen and diluent were gently mixed together with the tip of a pipette (sucking and release) being careful to avoid trauma to the spermatozoa. About 15µL of the diluted semen was then pipetted on to a glass microscope slide and cover slip placed on top. It was then observed under light microscope at ×40 magnification. Sperm quality was determined through assessment of the following parameters: sperm concentration, motility, and morphology [12, 13].

Sperm concentration was analyzed using the haemocytometer method [14]. The diluted semen sample was put into the counting chamber, and the number of spermatozoa was counted using a haemocytometer with improved doubles Neubauer ruling under a light microscope. The number of spermatozoa in five squares was counted. The mean was multiplied by 10^6 in order to obtain the sperm count. The sperm concentration was expressed as $\times 10^6$ ml^{-1}.

Sperm motility was analyzed and averaged by counting the motile and non-motile spermatozoa under a light microscope and expressed as the percent motility [14]. The

motility was determined by eye-estimation of the proportion of spermatozoa moving progressively straight forward at higher magnification (x40) and expressed as percentage. With this assessment, the spermatozoa were classified into three categories according to their motility: progressive, in situ and immobile. The spermatozoa with progressive motility are those with lineal forward movements; in situ motility refers to those with circular or local movements, and immobile sperm are spermatozoa without movements [15]. The motility was observed using the ×40 microscope objective lens. The number obtained in each category was expressed as a percentage.

Sperm total abnormality was assessed by adding two drops of warm eosin–nigrosin stain [14] to the semen (10µl) on a pre-warmed slide. A uniform smear was then made and air-dried. The stained slide was immediately examined under an oil immersion lens. For each rat, 200 spermatozoa were examined randomly for abnormalities in the head and/or the tail in different fields, and the percentage of total abnormalities was determined [16]. The normal spermatozoa, with a sickle-shaped head and large flagellae versus the abnormal ones with double head and fragmented or zigzag flagellae were distinguished.

Analysis of data was done using SPSS version 20. Results were presented as mean ± standard error of mean (SEM). Differences between groups were analysed by one way analysis of variance (ANOVA) followed by LSD post-hoc test. In all statistical analyses, differences were considered significant at $p < 0.05$.

RESULTS:

The results obtained are presented in Table 2. The 10mg/kg paroxetine significantly reduces the sperm count of rats in group II compared to the control rats in group I. There was also significant ($p<0.05$) reduction in sperm count of rats in groups III, IV, and V. However, there was significant ($p< 0.05$) increase in sperm count of rats in group VI, but no significant ($p> 0.05$) change in the sperm count of rats in group VII compared to the rats in the control group.

The 10.0mg/kg paroxetine also significantly ($p< 0.05$) reduced the sperm motility of rats in group II compared to the control. The sperm motility of rats in groups III and IV were also significantly reduced compared to the rats in the control group and in group II. The sperm motility of rats in groups VI and VII was increased significantly, but the increase observed in VI was more remarkable than in group VII. However, there was no significant ($p>0.05$) change in sperm motility of rats in group V.

The total sperm abnormality seen in groups II, III and IV showed significant ($p<0.05$) increase, though the increase in sperm abnormality seen

in group II was more than that seen in groups III and IV. There was also significant ($p<0.05$) reduction in sperm abnormality of rats in groups VI and VII compared to control, however, the reduction in group VI was more remarkable than that of group VII. There was no significant ($p>0.05$) difference in sperm abnormality observed in group V compared to the control group.

The plasma testosterone level in group II was significantly ($p<0.05$) lower compared to the control and other groups. Significant ($p< 0.05$) increase was observed in plasma testosterone level of rats in groups VI and VII. However, there was no significant ($p> 0.05$) difference in plasma testosterone of rats in group V compared to the control.

Table 2: Effect of propolis on SSRIs-induced sexual dysfunction on quality of semen and testosterone

Parameter	Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII
Sperm count ($x10^6$)/ml	236.17± 1.87	46.50± 1.02*	119.50± 1.23*^{b}	117.50± 1.84*^{b}	120.33± 0.84*^{b}	253.83± 0.67*^{b}	232.67± 1.59^b
Sperm motility %	78.67± 0.88	28.83± 2.89*	51.67± 1.05*^{b}	62.83± 1.20*^{b}	79.83± 0.60^b	88.83± 1.20*^{b}	87.83± 2.14*^{b}
Total abnormality %	29.00± 1.63	79.67± 3.96*	52.83± 0.95*^{b}	44.00± 1.21*^{b}	32.67± 1.12^b	18.33± 1.61*^{b}	21.00± .53*^{b}
Testosterone (nmol/l)	4.07± 0.14	1.53± 0.05*	3.09± 0.19*^{b}	3.51± 0.12*^{b}	4.18± 0.13^b	4.93± 0.03*^{b}	4.98± 0.07*^{b}

*$p<0.05$ when compared to control (group I); $^b p<0.05$ when compared to paroxetine treated only (group II)

DISCUSSION:

The result obtained for rats in group VI indicates that the 200mg/kg propolis tends to have reversed the suppressive effect of the 10mg/kg paroxetine and, at the same time, enhances sperm production in the rats. A full reversal to normalcy was obtained in rats in group VII that received the combined dose of 25mg/kg sildenafil and 200mg/kg propolis. The reduction of the sperm count in group II (untreated) was highly significant, perhaps because paroxetine overwhelmingly destroyed its testicular cells than that of other treated animals. The increase sperm count above was in tandem with the findings of Ayinde et al. in 2019 [7]. They observed significant elevation in plasma level of FSH in rats that received 10mg/kg paroxetine and high doses of propolis which could have been responsible for stimulation of Sertoli cells that heralded increase spermatogenesis. In the same vein, Al-sayed *et al.,*[17] also reported that propolis aided improvement of male rat fertility affected by aluminum chloride cytotoxicity which also supports the outcome of this study though with paroxetine toxicity. The present study is also in

concordance with the work of Capucho *et al*., [18] who observed that propolis increased sperm production and the epithelial height of the initial segment of the epididymis. The sperm motility in rats receiving high dose propolis (group VI) and propolis-sildenafil (group VII) was elevated, and even more significant in VI than VII. This indicates that PL can reverse the negative effect of paroxetine, and has the propensity to preserve the movement ability of spermatozoa which is a critical factor in the fertilizing capacity of spermatozoa in spite of the destructive effect of paroxetine.

This could be as a result of the antioxidant property of flavonoids in propolis that could have possibly reversed paroxetine toxicity in the energy system of the germ cells of the testis [19]. This result supports the in vitro study by Miroslava et al. in 2014 [20]. They reported that PL can improve sperm motility. However, the sperm motility of rats in groups III and IV was substantially reduced, except in group V where the effect was uneventful.

The total sperm abnormality counted was reduced appreciably in high dose propolis (group VI), and propolis-sildenafil combination (group VII) treated rats. Because PL is known to be a scavenger of free radicals [21], it has the tendency to prevent oxidation of cell membrane lipids. The low total sperm abnormality seen in this study supports the findings of Fischer et al. in 2007 [22]. They found out that PL can preserve cellular immune response by increasing mRNA for interferon-γ and onward activation of cytokines, thus accelerating anti-inflammatory processes. In contrary, abnormality in group II, untreated paroxetine administered rats was globally increased. This is not surprising because of the destructive side effect of paroxetine that could have affected the germinal cells of the testis.

The total structural abnormality of sperm cells was increasingly more observed in paroxetine untreated, sildenafil alone, and low dose propolis treated rats intervention. This can be arrogated to the residual destructive effect of paroxetine concentrated in the testicular tissues that has not been completely metabolized in the rats. It was not surprising that the group given sildenafil intervention alone could not remedy the structural abnormality observed in sperm cells caused by destructive effect of paroxetine. This is because sildenafil is only known to be erectile enhancing drugs and not an antidote for structural abnormality in sperm cells. The sperm abnormality of group V treated rats was also not affected over the period of the experiment, this showed that moderate dose of propolis also confers some level of protections on sperm cells. At a high dose of propolis (200mg/kg), plasma level of testosterone increased. This could have been responsible for the elevation in sperm count due to alteration in the hypothalamo-pituitary-testicular axis. The result of this study supports the findings of Mokhtar et al. in 2010 [23]. They

concluded that PL increased testosterone level and improved the quality of semen. Doses of propolis, and sildenafil administration, groups II, III and IV showed significant decrease in, plasma level of testosterone, while groups VI and VII reflected significant increase except in group V that had uneventful plasma testosterone level.

CONCLUSION:

From the result of the present study propolis caused a dose-dependent alteration in plasma testosterone level. The high dose propolis caused significant increase in the level of plasma testosterone which led to improvement in sperm count and motility as seen in the analysis of the seminal fluid.

Recommendation

In the present study the results obtained show that propolis can cause alterations in the fertility parameters involved in the reproductive system of male rats. However, more study is needed to fully understand some other physiological mechanisms involved, and to further explore any other benefits inherent in propolis on the reproductive system of male rats.

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ASSESSMENT ON THE EFFECTIVENESS OF COMMUNICATION BETWEEN RADIOGRAPHERS AND PATIENTS DURING GENERAL RADIOGRAPHIC EXAMINATIONS AT PORT MORESBY GENERAL HOSPITAL, PAPUA NEW GUINEA

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ABSTRACT:
Patient communication is highly regarded as one of the basis of health care and an important part of practice in the application of radiographic procedures. Good communication is necessary in medical imaging if optimum diagnostic images are to be achieved. This study is a prospective assessment on the effectiveness of communication among radiographers and patients during general radiographic procedures at the Port Moresby General Hospital (PMGH). Questionnaires were administered to 100 patients and 15 radiographers using a quantitative approach for data collection. Informed consent was obtained from each of the participants, after obtaining ethical clearance from the authorities. The responses in the questionnaires were recorded in Excel Spread sheet. The data was statistically analysed using Microsoft Excel 2013. A majority (78%) of the patients reported that there were no communication problems while more than half (57%) expressed satisfaction with the radiographic services that were provided. A majority (67%) of radiographers reported that language barrier was the cause of communication problems during radiographic procedures. The result indicated that although there was communication between radiographers and patients, the most common factor affecting effective communication was language barrier.

Keywords: radiographer, multicultural communication, patient centric communication, non-verbal communication, radiation protection, Papua New Guinea

INTRODUCTION:

Communication is rapidly changing, not static, may be verbal or non-verbal, culturally based and dynamic [1]. Interpersonal communication between a radiographer and a patient plays an important role in the success of radiographic examinations. In many countries, an important challenge to health care is the provision of services to a population that is culturally diverse and speaks a lot of different languages [2-3]. Radiographers are trained health professionals in the field of radiology [4]. They provide health care services to a very diverse population like Papua New Guinea (PNG), with

about 700 different languages. Being a competent communicator requires flexibility in understanding what approach is more likely to work best in a particular situation. This is one of the skills radiographers have to master to be competent communicators in the health care team to provide caring services and to meet the needs of a diverse society in PNG while producing high quality images during general radiographic examinations.

Multicultural Communication:

Translating patient education in a health care setting where many cultures are identified refers to multicultural communication [2]. Patient communication in a diverse and multicultural country like PNG can be challenging. There are approximately 715 indigenous languages spoken in PNG, many of them unrelated [5], making it the most linguistically diverse place on earth. The centralization of patients in the nation's capital, Port Moresby, from all around the country is a result of rural-to-urban migration [6]. People tend to move to urban areas just to have access to basic services like health care, bringing complex language and cultural background in the hospital setting [2]. Radiographers in PNG provide patient care to a very diverse population made up of different tribes speaking different languages thus making communication difficult. In an effort to achieve the best possible outcome on a radiograph for an accurate diagnosis, radiographers must consider applying the skills of effective patient communication [1, 4, 7-8]. Language and communication style may vary again when conversing with different people of different educational levels, race, age groups, gender and places [1-2]. It is often helpful to put oneself in the patients place and adapt communication to the needs, expectations and abilities of the patient.

Non-verbal Communication:

Verbal communication alone is often ineffective and requires the radiographer to be skilled and communicate using non-verbal communication. Non-verbal communication involves the use of facial expression, body language, posture, gestures, eye contact and touch to deliver a message [7-8]. The human face is extremely expressive, able to convey countless emotions without saying a word. Unlike some forms of non-verbal communication, facial expressions are universal. However, the facial expressions for happiness, sadness, anger, surprise, fear, and disgust may vary across cultures [8]. When using body movements and posture, a radiographer must consider how their perceptions of patients are affected by the way they sit, walk, stand up, or hold their head. When a person waves, points, pleads, and often use their hands when arguing or speaking in an animated way, they are using gestures. However, the meaning of gestures can vary

across cultures and regions, so it is important to be careful to avoid misinterpretation [8]. Since the visual sense is dominant for most people, eye contact is an especially important type of non-verbal communication. The way a person looks at someone can communicate many things, including interest, affection, hostility, or attraction. Eye contact could mean sign of positive regard and respect in most of the western countries where as decades ago in some parts of Nigeria, direct eye contact might be regarded as disrespectful to an older person or passing a romantic/flirting message to an opposite sex [8]. Eye contact is also important in maintaining the flow of conversation and for assessing another person's response. People communicate a great deal through touch. A health care professional can gain a patients trust with a firm handshake, a timid tap on the shoulder, a reassuring pat on the back, a patronizing pat on the head, or a controlling grip on the arm. Radiographers in Ghana applied other methods such as touch, hand gestures and sign language to overcome language barriers [2]. Effective communication with the patient demonstrates that the radiographer has an interest in the patient, his or her circumstances and specific needs for care [2, 4, 8].

Patient Centric Communication:

Patient centric communication is interaction centred on the patient with a hope to achieve the best possible imaging outcome for the patient [9]. When patients are more involved in their care, they are better able to manage complex chronic conditions by understanding and incorporating their plan of care, are more likely to feel comfortable communicating their concerns and seeking appropriate assistance, have reduced anxiety and stress, and have shorter lengths of stay in a hospital [9]. Staff shortages may be a distraction from patient centric communication [4]. The shortage of staff decreases the time spent between health care professionals and patients. According to the World Health Organization (WHO), there is a shortage of approximately 3 to 4 million health workers worldwide; with the result that time is an increasingly scarce resource in the workplace [10]. This can hinder patient centric communication between health professionals and patients thus increasing patient's anxiety and stress.

Effective Communication and Impact on Radiographic Image Quality:

Communication is intrinsic to human characteristic, everyone communicates, yet not everyone takes time to communicate effectively. Effective communication is a two-way dialogue between patients and provider, or by definition, a two-way road where both speak and are as well listened to without either interrupting, both ask questions for clarity, express opinions and inter-change information,

and both are able to completely grasp and understand what the other means to say [8]. Therefore, it involves the interaction in which each sender performs also as receivers; and vice versa [8]. To produce quality images, radiographers must apply three major interrelated categories of radiographic quality which include; film factors, geometric factors and subject factors [11]. Of these three categories, subject factor involves radiographer to patient interaction before and during radiologic examinations. Movement during the examination can produce a loss in radiographic quality called 'motion blur' which may result in repeated radiographs [11]. A radiographer can reduce motion blur by carefully giving instructions to patients as follows: "Take a deep breath and hold it" or "Don't move." It is important to bear in mind that the grammar and vocabulary chosen to express an idea, together with pitch, volume, rhythm used to deliver it, all affect how the message is received and understood [1]. Effective communication is all about working with the patient to achieve the goals that the radiographer and patient both agree on for the patient's well-being [1].

Patient Communication and Impact on Radiation Protection:

Patient communication and interaction is also an effective method of radiation protection in a radiology department from the large amount of man-made radiation produced by these sophisticated equipment [12]. Patient preparation before a radiographic procedure is another important part in clinical practice where the use of proper radiographer to patient communication is vital for the reduction of total patient radiation dose. To avoid any artefacts on a resultant radiograph and possible retakes, a radiographer must verbally ask the patient to remove any unwanted artefacts. Out of seven ways of reducing patient exposure to radiation, minimum repeat exposures can be achieved by means of proper patient communication [12]. Proper patient communication during patient preparation can account for a reduction in the examination time and the total amount of radiation dosage that is administered to the patient. Patients overexposed to ionizing radiation are at risk of developing radiation related diseases and may pay a higher fee because of a repeat exposure in a private hospital setting [4]. A repeat exposure may be performed to achieve an acceptable image; however, there would be an increase in the radiation dosage to the patient which according to an ethical stand point, is not 'As Low As Reasonably Achievable' (ALARA) and is contradictory to the ALARA principle [13]. Communicating clear instructions to the patient can encourage understanding and cooperation. Patient communication is highly regarded as the basis of health care and an important part of practice in the application of radiographic procedures. It is however a neglected area of

research in medical imaging in PNG, despite the necessity for good communication if optimum diagnostic images are to be achieved.

PNG is a developing country with a growing population of over seven million [14-15]. There are twenty-two different provinces and the National Capital District (NCD) in four administrative regions. The rural areas of PNG comprise a higher population of 87.5% whilst only 12.5% of the populations live in urban areas and about 31 million people in the capital Port Moresby [14-15].

Research Rationale and Aim of Study:

Patients tend to be kept in suspense and are traumatized by the radiographic examinations they go through because of the lack of proper communication [16]. Many factors may affect radiographer and patient communication and thus can prevent the examination from been performed or account for a repeat exposure. These factors include the overload of patients, educational levels of patients, failure of greeting and introduction between radiographer and patient, improper procedure explanation, language barrier and a low voice projection [4]. In cases where there is poor radiographer to patient communication before, during and after the examination, the patients may be uncooperative or may not know what to expect or what to do during the examination. This will affect the outcome of the examination in terms of image quality and the amount of radiation dosage administered to patients [4, 13]. Developing good oral communication takes time, practice and constructive evaluation and feedback from patients, colleagues and departmental heads [4]. There are no published studies on the effectiveness of communication between radiographers and patients and its impact on general radiographic examinations in PNG.

The major objective of this study was to prospectively assess the effectiveness of communication between radiographers and patients during general radiographic examinations at the PMGH.

METHODOLOGY:

This was a prospective hospital based cross-sectional study conducted at the PMGH Radiology Department [17-18]. The PMGH is the major public general, specialist and reference hospital in the National Capital District (NCD) and PNG [19]. It is also the teaching hospital for the School of Medicine and Health Sciences (SMHS), University of Papua New Guinea (UPNG). The patients represented a cross-section of the NCD and the Central Province population [19].

Patients that presented for radiographic examinations at the PMGH for the first time during the study period were eligible for enrolment in the study. Thus, convenience sampling strategy was used for the selection of the patients. Since the number of

radiographers present during the study period was very small, convenience sampling technique was also used [4]. The sample size was 110 patients and 15 radiographers that participated in the study.

Pre-tested questionnaires comprising close-ended questions were administered to the selected patients and radiographers using a quantitative approach for data collection [17-18]. The questionnaire contains five sections. The demography of the patient; information collected included gender, date of birth, age of patients and educational levels. In the other four sections variables collected included the factors that affected radiographer to patient communication, such as, failure of greeting and introduction between radiographer and patient, improper procedure explanation, language barriers, staff shortages and influx of patient, if there was a communication problem and patient satisfaction after the examination [4]. The data were recorded in Microsoft (MS) Excel Spreadsheets and analysed statistically using Excel Data Pack version 2013.

Exclusion criteria:

Patients who suffered from traumatic injuries, shortness of breath and those that spoke other native languages apart from Pidgin and English were excluded from this study. Paediatrics patients, patients whose age ranged below 18 years and geriatrics patients whose age ranged above 60 years were also excluded from the study.

Ethical approval for this study was granted by the School of Medicine and Health Science Research and Ethics Committee (SMHS REC). Written consent was granted by the Director of Medical Service at PMGH with the approval from the Head of Radiology Department. Participation in both the patient and radiographer survey was entirely voluntary.

RESULTS:

Of the 110 patients selected to participate in this study 10 were excluded because of the exclusion criteria. Thus, 100 patients were found suitable to participate in the present study. The mean age for all patients was 35 years and the age range was 18 to 60 years. For the educational levels of the 100 patients, 11% never had a formal education, 29% finished at primary school, 33% dropped out of secondary school and 27% completed studies at the tertiary level.

Patients' response before the radiographic examination:

Table 1 shows the percentage distribution of patients' responses to questions related to knowledge before the radiographic examination. The majority (81%) of the patients responded "No" when asked whether they had any knowledge on the imaging modality used and its biological effects. More than half (51%)

of the patients responded "No" when asked whether it was their first time to have an x-ray. A total of 51% of the patients responded "No" when asked whether they were nervous of what will happen during the radiographic examination.

Patients' response after the radiographic examination:

Table 2 shows the percentage distribution of patients' responses to questions related to communication and expectations after the radiographic examination. A total of 51% of the patients responded "Yes" when asked whether the staff explained the procedure and greeted them in a well projected voice. The majority (79%) of the patients responded "Yes" when asked whether they understood what to do during the procedure. More than half (59%) of the patients responded "Yes" when asked whether there was enough time allocated for communication. Most (78%) of the patients responded "No" when asked whether there was a communication problem.

Patient satisfaction with radiology services:

The result in Table 3 shows the patients' satisfaction with the services provided at PMGH radiology department. In response to the question, 36% "Strongly agree" that they were satisfied and happy with the service that was provided while 57% said that they "Agree".

Radiographers' responses:

When asked whether they explained the procedure to the patients before the examination, 93% of the radiographers responded "Yes". In response to the second question 87% said "Yes" that they probed for feedback to ensure that the patients understood the procedure. When asked whether they informed the patient when the procedure was commencing, 93% of the radiographers' responded "Yes". The other results are presented in Table 4.

DISCUSSION:

In the present study the response rate was 90.9%. The questionnaires of 100 of the 110 patients selected were completed and found suitable for analysis, because of strict implementation of the exclusion criteria.

Patients' response before the radiographic examination:

In the present study, 81% of the patients reported that they had no knowledge of the radiographic equipment that was used to examine them including its biological effects. This indicated low level of anxiety before the examination.

Table 1: Percentage (n) distribution of the responses of the patients before the radiographic examination.

	Yes % (n)	No % (n)
Do you have any knowledge on the imaging modality used and its biological effects?	19 (19)	81 (81)
Is this your first time to have an x-ray?	49 (49)	51 (51)
Are you nervous of what will happen during the exam?	49 (49)	51 (51)

Table 2: Percentage (n) distribution of the responses of the patients after the radiographic examination.

	Yes % (n)	No % (n)
Did the staff explain the procedure and greet you in a well projected voice?	51 (51)	49 (49)
Did you understand what to do during the procedure?	79 (79)	21 (21)
Was there enough time allocated for communication?	59 (59)	41 (41)
Was there a communication problem?	22 (22)	78 (78)

Table 3: Percentage (n) showing patient's satisfaction with the services provided at PMGH radiology department.

	Strongly agree % (n)	Agree % (n)	Disagree % (n)	Strongly disagree % (n)
Patient was satisfied and happy with the service that was provided	36 (36)	57 (57)	3 (3)	4 (4)

Table 4: Percentage (n) distribution of the responses of the radiographers.

	Yes % (n)	No % (n)
Did you explain the procedure to the patients?	93.3 (14)	6.7 (1)
Did you probed for feedback to establish that the patient understood the procedure?	86.7 (13)	13.3 (2)
Did you inform the patient when the procedure was commencing?	93.3 (14)	6.7 (1)
Was communication affected by language barriers?	66.7 (10)	33.3 (5)
Did you use methods such as touch, hand gestures and sign language to overcome language barriers?	73.3 (11)	26.7 (4)
Did you give information to the patient pertaining where to go after the procedure to collect results?	100 (15)	0
Was communication affected by the shortage of staff and influx of patients?	40.0 (6)	60.0 (9)
Was there a communication problem?	53.3 (8)	46.7 (7)

Low anxiety levels were achieved because most of the patients (51%) indicated that it was not their first time to undergo a general radiographic examination; in addition, the patients were not nervous of what will happen during the examination. This finding was in contrast to a study by Beyer and Diedericks [20] who reported that 13% of the patients in

their study were not told what was expected from them and what the examination entailed. When patients do not receive clear instructions, this can lead to radiographs being repeated resulting in unnecessary radiation exposure of the patients [4, 11-13, 20]. The same study revealed that more than half of the study population (53%) received one or more repeated projection and 12% were not given an explanation for the need for the repeat [20]. The present study however did not ask patients whether any repeated projections were done.

Patients' response after the radiographic examination:

In the present study 59% of patients reported after the examination that there was enough time given for communication by the radiographer, the radiographer explained the procedure with a well projected voice (51%) and that they understood what to do (79%) after instructions were given during the procedure. Overall, there was limited communication problem experienced by the patients in the present study. These findings however are in contrast to studies done elsewhere [4, 21-22] that reported high prevalence of communication problems. This difference can be explained by selective hearing or listening to what the patient may choose to listen to [4]. Some patients may be so worried about their illnesses to take notice of the greetings and explanation of radiographic procedure by the radiographer. It could also be that the patients consider this part of the interaction to be of little importance that they hardly noticed it. The other explanation could be that the radiographers were so much in a hurry that minimal attention was given to greetings and other matters of professional conduct resulting in lack of patient-centric communication etiquette [4, 9-10].

Patient satisfaction with radiology services:

Patient satisfaction surveys serve as an avenue to assess communication and information transfer between clinicians and patients and can therefore be a patient's medium of expressing dissatisfaction with the provision of information [23]. The present study revealed that a majority (93%) of the patients expressed satisfaction with the radiology services provided. This finding is similar to a study in two major public and private hospitals in Ghana where majority (81.5%) of the study population expressed satisfaction with the overall quality of diagnostic radiology care [23]. The same study revealed that 97% of patients expressed satisfaction with overall quality of diagnostic radiology care in the private hospital. A similar study in Zimbabwe [4] found that 87% of patients in a private hospital were satisfied with the radiology services provided. Another similar study [2] in Ghana revealed that over 50% of patients showed an overall satisfaction with radiology service in the department.

Therefore, results in the present study concur with other studies [2, 4, 23] implying that most of the patients were happy with the information that was provided to them after the examination and only a few expressed dissatisfaction with the radiographer's communication with patients.

Radiographers' response during the radiographic examination:

In the present study, 93% of the radiographers reported that they explained the procedure to the patient and probed for feedback (87%) to establish that the patient understood what to do during the procedure. These findings concur with studies done elsewhere [4, 20], reflecting effective communication between radiographer and patient [1-2, 4, 8]. Despite the effective communication between the radiographers and patients in the present study, 67% of the radiographers stated that language barriers were the cause of communication problems at PMGH. This required the radiographers to used non-verbal communication to overcome language barriers [2, 7-8].

Methods such as touch, hand gestures, eye contact and sign language were used to overcome language barriers as demonstrated by 73% of radiographers in the present study. This finding agrees with a study done in Ghana [2]. Ghana and PNG are two culturally diverse countries and therefore require radiographers to learn to interact using multicultural communication methods. This encourages and enhances the cooperation and participation of the patient in the radiographic procedure.

In the present study, 53% of radiographers reported that there was communication problem between radiographers and patients during the radiographic procedure. This response could be confirmed by the notion that radiographers often barked instructions to the patients behind the control panel, especially in the public hospital [4]. Observations during the present study also revealed that radiographers tend to bark information to patients from behind the control panel causing misunderstanding between patient and radiographer. This may result in repeat exposure thus increasing the radiation dosage to patients [4, 11-13, 20]. Out of seven ways of reducing patient exposure to radiation, minimum repeat exposures can be achieved by means of proper patient communication [12].

All the radiographers in the present study stated that they gave information to the patient pertaining where to go after the procedure to collect results.

This increased patient satisfaction (93%). About 40% of the radiographers in the present study reported that staff shortages and the influx of patients had negative impact on effective radiographer to patient communication. This finding agrees with the results by Rugare et al. [4]; in a public hospital

64% of the radiographers stated that staff shortages and the influx of patients were contributory factors in communication problems. Due to global shortage of approximately 3 to 4 million health workers worldwide; the result is that time is an increasingly scarce resource in the workplace [10], impacting on negative communication skills between health worker and patients. Although, there was a low prevalence of staff shortages and influx of patients affecting communication in the present study, the results were not significant to suggest that staff shortages were a common factor affecting communication between radiographers and patients at PMGH.

CONCLUSION:

There was relatively good radiographer to patient communication at PMGH according to the results (78%) by acquiring feedback from patients. More than half (57%) of the patients were satisfied with the radiographic services that were provided. A majority (67%) of radiographers reported that language barriers were the cause of communication problems during radiographic procedures. There is however more room for improvement and requires the radiographers at PMGH to develop the skills of multicultural and patient-centric communication in order to improve patient care. This can be achieved through in-house training workshops to equip radiographers with communication and patient interaction skill necessary to carry out a successful radiographic examination and assess patient communication on a regular basis.

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THE INFLUENCE OF ADOLESCENTS PERCEIVED FAMILY FUNCTION ON THE USE OF SOCIAL MEDIA AS A MEANS TO SOLVING LIFE PROBLEMS

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Running Title: Adolescents Perceived Family Function

ABSTRACT:
The challenges of the adolescents range from health-related ones to antisocial behaviors. When family support is poor, an adolescent is confronted with seeking help from many sources including the social media with many unguided information. This study aims to assess the influence of perceived family functionality on where adolescents seek for solution to problems affecting their life. A descriptive cross-sectional study of 287 adolescents selected over 3 months' period through systematic random sampling using an interviewer administered questionnaire. Majority of the respondents were from highly functional families (71.5%). Discussing their divergent view of religion was the commonest life problem reported (65.2%). Severely dysfunctional family was significantly associated ($p<0.05$) with uncertainty about their future, incongruous religious views from the family and substance abuse. Respondents from severely dysfunctional family significantly ($p<0.05$) sought solutions for goals setting, parental expectation, substance abuse and academic problems from the internet. Functional family setting has a protective role on adolescents' management of their peculiar life challenges. Including family counseling to the evaluation of adolescents and their parents by clinician will help adolescents quest for solutions to their life problems.

Keywords: Adolescents, Family, Problems, Social media
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INTRODUCTION:

Adolescents are faced with diverse challenges as they move from childhood to adulthood [1]. Some of these are as a result of the rapid developmental changes they encounter and societal expectation of them to pattern their behavior according to societal norms and some set of values [1]. Many of the adolescents' problems receive little or no attention, thus a lot of them scrabble about in darkness not knowing what to do about their challenges posed by their developmental experiences and survival [1]. Most adolescents transfer this

ignorance to adulthood which often affects their perception about life [2].

Adolescence period is a period of storm and crisis which everyone must see as needing urgent attention from parents to health workers, if the task of nation building must experience a success. Chinawa et al [3] have reported several forms of behavioral problems in adolescents which included tobacco use, unsafe premarital sex and suicidal attempts. These and many more challenges like deviant identity and behavioral anomalies could be avoided if the people in this age group are properly assisted to have a successful passage through this period [4].

The family play an important role both in what the adolescent boy or girl turns out to be and in their smooth transition from childhood to adulthood. According to Weiss et al [5], events at infancy such as temperament during the first year of life and child conduct problems had a predictive association with parenting. They also found that hyperactivity and conduct problems during ages 4–13 years were correlated with infant fussiness [5].

The way and manner adolescent perceive their family is instrumental to the way they access support from such family. The family may most probably be the best place for the adolescent to be guided as he/she traverse this period, but if the adolescent's perception of the family is that of a problematic one, such may consider support for life challenges from other sources. To further buttress this, Fleming reported that adolescents who had greater satisfaction with their family relationships have healthful behavioral patterns that guard against the development of obesity [6]. In the same manner Adams et al [7] reported the impact of perceived family function on adolescent's behavior when they found that adolescents with history of suicidal attempts had more distress and family dysfunction than their non-suicidal peers. In the same study, they also found that perceived family functioning was correlated with the level of depression, hopelessness and self-esteem in the adolescent [7]. Adolescents are peculiar in that they are exposed to strong influence from their social environment [8]. They sense independence as something to experiment with and when they have a good family support they tend to thrive better [9]. The family is a strong and safe place for the adolescent to learn and imbibe good culture for the management of various challenges that they encounter in life [9]. Family functioning differs from parenting style and family structure [10,11]. Concerning family functioning, there is a combination of parental socialization and family structure with a strong focus on encouraging and habituating behaviors by all members of the household working as a system [12]. This idea creates a better understanding on how the family unit is involved in the formation and maintenance of healthy behaviors.

It is however of note that there are other contending forces which puts pressure on the

adolescent when they are faced with life problems. From the negative influence of peer group pressure which leads to aggressiveness, deliquesces and substance abuse to the social media where through interaction with virtual friends they keep learning 'strange' strategies to solving life problems [13]. The adolescents continually have to decide where to turn to for the purpose of solving the challenges they are faced with in life.

One of the medium where an adolescent easily turns to for creativity, collaborative learning and digital media literacy is the social media [14]. The social media become readily available to adolescents who are exploring opportunities to connect to new friends and form new relationships in online global communities. The rate at which adolescents use social media has increased tremendously in this century to the extent that many spend most days of the week on social media [13,15]. The adolescents through social media form social network which often could be long lasting. Other benefits of the social media include exploration of identities and relationship development with family and friends. It has been noted that social media usage lowers the feeling of loneliness among adolescents [14].

As beneficial as the social media is, there are sites which an unsuspecting curious adolescent could access which could lead to some risks that are damaging to the young growing mind. Such include cyber-bullying, data breaches, uploading inappropriate content like provocative photos and videos, and inappropriate content like mean aggressive violent sexual comments and images [16]. A study has reported that online social networking is adversely associated with the psychological status of adolescents [14]. The concept of Facebook depression has become a legitimate medical concern in adolescents [17].

The use of internet and social media has been reported to have effect on family relationship and social relations at large [14]. Previous reports have noted that adolescents with psychiatric illness have increased usage of social media daily [18,19]. Data on adolescent and social media usage in relation to family functionality is scarce in Nigeria and none from our locality. Thus the aim of this study was to assess the influence of adolescents' perceived family function on 'the use of social media as a means to solving life problems.

METHODOLOGY:

This was a hospital based cross sectional study of adolescents who presented at the outpatient clinics of a tertiary institution. In the health institution of study, adolescents are seen for regular clinic attendance at both the Pediatric and General Outpatient Clinics. Adolescents aged 10 to 15 years are attended to at the Pediatric Outpatient Clinic whereas those above 15 years are attended to at the Adult Outpatient Clinic.

The study was carried out using a systematic sampling technique. Sample size was

calculated using a prevalence rate of 25% estimated to be using social media [20]. A minimum sample size of 287 respondents was arrived at. The inclusion criteria include all adolescent patients aged 10-19 years. All adolescents aged 10 -19 years who assented and or consented to participate were recruited, after parental permission were obtained. Adolescents who were critically ill and those that were married were excluded. Married adolescents were excluded because the effect of their own family dynamics on sexuality may be different from what operates when they were with their parents.

Data collection and study instrument: The survey was conducted using standardized interviewer-administered questionnaires. The questionnaire evaluated for socio-demographic details of the adolescent, their perceived life problems, where the respondents turn to for solutions (family or internet) when they have a problem and the perceived family functionality of the respondents using the Smithklein's APGAR's scoring system [21] to determine whether their family is highly functional, moderately dysfunctional or severely dysfunctional. Assent was sought from parents who accompanied the adolescents who were less than 18 years in addition to the respondent's consent which was obtained. The adolescents who were accompanied by their parents were put in a different room where they were interviewed in the absence of their care givers/parents with assurance of confidentiality. They were also assured of the willingness to discontinue with the study at any time during the interview. The parents had no input in the response of the adolescents during the study. In each clinic, the consenting adolescents were recruited through the systematic random sampling from the sampling frame.

Ethical considerations: The purpose of the study was explained to the participants in plain and clear language and only those who gave consent and assent as appropriate, were recruited for the study. Refusal to participate in the study did not affect the care given the adolescents who presented for care at the clinics as all received the same standard care. The Research and Ethics Committee of the institution gave approval for this study.

Data analysis: All data collected were sorted, coded and analyzed using the Statistical Package for Social Sciences (SPSS) software; version 20. Frequency tables and charts were generated for relevant variables. Proportions and percentages were also determined as applicable. Categorical variables were summarized using proportions. Chi-square statistics was used to find the level of significance between categorical variables.

RESULTS:

Perceived life problems of respondents

This section contains 20 questions (Q1 to Q20). The responses to the questions are presented in Table 1. In response to the question on parent's expectation (Q8), 48.8%

said that they are concern about meeting the expectations of their parents. When asked if they have difficulty following their parent religion (Q9), 79.1% said "NO". When asked if they have role model (Q12), 62% said "Yes". A total of 81.9% said they did not believe in taking drugs to feel secure (Q16). Majority of the respondents (88.5%) said they have not experiment with cigarette (Q17).

Table 1 Frequency distribution of respondents according to Perceived life problems (n = 287)

Perceived Life Problems	Yes % (n)	No % (n)
1. Self-direction	35.9 (103)	64.1 (184)
2. Setting of goals	34.1 (98)	65.9 (189)
3. Pulling through with set goals	27.5 (79)	72.5 (208)
4. Accepting established norms	30.3 (87)	69.7 (200)
5. Knowing what one ought to do and be	30.3 (87)	69.7 (200)
6. Handling peer group pressure	24.7 (71)	75.3 (216)
7. Uncertainty about the future	32.4 (94)	67.2 (193)
8. Concern about meeting parents expectation	48.8 (140)	51.2 (147)
9. Difficulty following parents' religion	20.9 (60)	79.1 (227)
10. Discussing divergent view of religion in the family	34.8 (100)	65.2 (187)
11. Handling relationship with opposite sex	23.0 (66)	77.0 (221)
12. Do you have a role model?	62.0 (178)	37.6 (108)
13. Difficulty choosing a life career	27.5 (78)	72.5 (208)
14. Having opinion conflict with generally held views	37.3 (107)	62.7 (180)
15. Insecurity with bodily appearance	23.0 (66)	77.0 (221)
16. Do taking drugs keep one secure?	18.1 (52)	81.9 (235)
17. Ever experimented with Cigarette	10.5 (30)	88.5 (267)
18. Ever experimented with alcohol	21.6 (62)	78.4 (225)
19. Assurance of who you will turn out to be	47.7 (137)	52.3 (150)
20. Having problems with academics	25.8 (74)	74.2 (213)

Relationship between perceived adolescent problems and family functionality

As shown in Table 2, Adolescents' family functionalities were significantly associated with the sundry perceived life problems facing them. More adolescents from severely dysfunctional families compared to those from highly functional ones were confused about knowing what they want to become in life (X^2=20.069, df=2, p=<0.0001), uncertain about their future (X^2=8.098, df=2, p=0.017), had difficulty following their parents religion (X^2=8.120, df=2, p=0.017), discussing divergent religious view with their families (X^2=10.454, df=2, p=0.005), difficulty in choosing a life career (X^2=14.138, df=2, p=0.001), taking drugs to feel secure (X^2=10.279, df=2, p=0.006), Ever experimented with cigarette (X^2=16.261, df=2, p=<0.0001), and having problems with academics (X^2=19.265, df=2, p=<0.0001). There were no significant relations found with other thematic areas assessed (Table 2).

Table 2: Relationship between perceived adolescent life problems and their family functionality

Perceived Life Problems	Response	Highly functional (%)	Moderately dysfunctional (%)	Severely dysfunctional (%)	Total	X^2	P value
Self-direction	Yes	34.1 (70)	37.5 (27)	60.0 (6)	103	2.878	0.237
	No	65.9 (135)	62.5 (45)	40.0 (4)	184		
Setting goals	Yes	35.1 (72)	27.8 (20)	60.0 (6)	98	4.358	0.113
	No	64.9 (133)	72.2 (52)	40.0 (4)	189		
Pulling through with set goals	Yes	25.4 (52)	30.6 (22)	50.0 (5)	79	3.343	0.188
	No	74.6 (154)	69.4 (50)	50.0 (5)	208		
Accepting established norms	Yes	27.8 (57)	34.7 (25)	50.0 (5)	87	3.108	0.211
	No	72.2 (148)	65.3 (47)	50.0 (5)	200		
Knowing what one is meant to do and be	Yes	23.9 (49)	41.7 (30)	80.0 (8)	87	20.069	<0.0001
	No	76.1 (156)	58.3 (42)	20.0 (2)	200		
Handling peer group pressure	Yes	24.9 (51)	23.6 (17)	30.0 (3)	71	0.200	0.905
	No	75.1 (154)	76.4 (55)	70.0 (7)	216		
Uncertainty about the future	Yes	27.8 (57)	44.4 (32)	50.0 (5)	94	8.098	0.017
	No	72.2 (148)	55.6 (40)	50.0 (5)	193		
Concern about meeting parents expectation	Yes	47.8 (98)	48.6 (35)	70.0 (7)	140	1.881	0.390
	No	52.2 (107)	51.4 (37)	30.0 (3)	147		
Difficulty following parents' religion	Yes	16.6 (34)	31.9 (23)	30.0 (3)	60	8.120	0.017
	No	83.4 (171)	68.1 (49)	70.0 (7)	227		
Discussing divergent view of religion in the family	Yes	29.3 (60)	47.2 (34)	60.0 (6)	100	10.454	0.005
	No	70.7 (145)	52.8 (38)	40.0 (4)			
Handling relationship with opposite sex	Yes	21.0 (43)	26.4 (19)	40.0 (4)	66	2.573	0.276
	No	79.0 (162)	73.6 (53)	60.0 (6)	221		
Do you have a role model	Yes	64.4 (132)	58.3 (42)	44.4 (4)	178	2.084	0.353
	No	35.6 (73)	41.7 (30)	55.6 (5)			
Difficulty choosing a life career	Yes	21.5 (44)	44.4 (32	30.0 (3)	79	14.138	0.001
	No	78.5 (161)	55.6 (40)	70.0 (7)	208		
Having opinion conflict with generally held views	Yes	33.7 (69)	45.8 (33)	50.0 (5)	107	4.095	0.129
	No	66.3 (136)	54.2 (39%)	50.0 (5)	180		
Insecurity with bodily appearance	Yes	20.5 (40)	29.2 (21)	30.0 (3)	66	2.554	0.279
	No	79.5 (163)	70.8 (51)	70.0 (7)	221		
Do taking drugs keep one secure	Yes	13.7 (28)	30.6 (22)	20.0 (2)	52	10.279	0.006
	No	86.3 (177)	69.4 (50)	80.0 (8)	235		
Ever experimented with Cigarette	Yes	5.9 (12)	22.2 (16)	20.0 (2)	30	16.261	<0.0001
	No	94.1 (193)	77.8 (56)	80.0 (8)	257		
Ever experimented with alcohol	Yes	18.5 (38)	27.8 (20)	40.0 (4)	62	4.758	0.093
	No	81.5 (167)	72.2 (52)	60.0 (6)	225		
Assurance of who you will turn out to be	Yes	49.3 (101)	41.7 (30)	60.0 (6)	137	1.859	0.395
	No	50.7 (104)	58.3 (42	40.0 (4)	150		
Having problems with academics	Yes	21.0 (43)	31.9 (23)	80.0 (8)	74	19.265	<0.0001
	No	79.0 (167)	68.1 (49)	20.0 (2)	213		

Effect of family functionality on where adolescents seek for solution to their life problems. As shown in table 3, more respondents from severely dysfunctional family sought help from the internet in respect of setting their life goals (X^2=6.108, df=2, p=0.047), on meeting their parents' expectation (X^2=6.961, df=2, p=0.031), handling relationship with opposite sex (X^2=6.77, df=2, p=0.034), Experimenting with cigarette (X^2=8.156, df=2, p=0.017), and academic problems (X^2=6.025, df=2, p=0.049). Whereas there was no significant relationship found between family functionality, internet use, and other perceived problems of the participants with other thematic areas assessed, adolescents from highly functional families however sought solution from the internet in respect of dangers of taking drugs to keep secure (X^2=6.077, df=2, p=0.048) (Table 3).

Table 3: The effect of family function on where respondents seek for solution to life problems

Problems	Source of Solution	Highly functional family (%)	Moderately dysfunctional family (%)	Severely dysfunctional family (%)	X^2	P value
Self-direction	Family	74.3 (52)	81.5 (22)	33.3 (2)	5.912	0.052
	Internet	25.7 (18)	18.5 (5)	66.7 (4)		
Setting of goals	Family	68.5 (50)	18.0 (90)	40.0 (2)	6.108	0.047
	Internet	31.5 (23)	10.0 (2)	60 .0(3)		
Pulling through with set goals	Family	67.3 (35)	63.6 (14)	100.0 (5)	2.568	0.227
	Internet	32.7 (17)	36.4 (8)	0.0 (0)		
Accepting established norms	Family	54.4 (31)	64.0 (16)	20.0 (1)	3.303	0.192
	Internet	45.6 (26)	36.0 (9)	80.0 (4)		
Knowing what one ought to do and be	Family	69.4 (34)	66.7 (20)	37.5 (3)	3.122	0.210
	Internet	30.6 (15)	33.3 (10)	62.5 (5)		
Handling peer group pressure	Family	68.6 (35)	64.7 (11)	33.3 (3)	1.559	0.449
	Internet	31.4 (16)	35.3 (6)	66.7 (5)		
Uncertainty about the future	Family	66.7 (38)	68.8 (22)	37.5 (5)	2.398	0.302
	Internet	33.3 (19)	31.2 (10)	62.5 (0)		
Concern about meeting parents expectation	Family	74.5 (73)	74.3 (26)	28.6 (2)	6.961	0.031
	Internet	25.5 (25)	25.7 (9)	71.4 (5)		
Difficulty following parents' religion	Family	55.9 (19)	43.5 (10)	0.0 (0)	3.799	0.150
	Internet	44.1 (15)	56.5 (13)	100.0 (3)		
Discussing divergent view of religion in the family	Family	81.7 (49)	76.5 (26)	100.0 (6)	1.878	0.391
	Internet	18.3 (11)	23.5 (8)	0.0 (0)		
Handling relationship with opposite sex	Family	37.2 (16)	63.2 (12)	0.0 (0)	6.770	0.034
	Internet	62.8 (27)	36.8 (7)	100.0 (4)		
Do you have a role model	Family	75.8 (100)	61.0 (25)	40.0 (2)	5.817	0.055
	Internet	24.2 (32)	39.0 (16)	60.0 (3)		
Difficulty choosing a life career	Family	61.4 (27)	56.2 (18)	66.7 (2)	3.122	0.875
	Internet	38.6 (17)	43.8 (14)	33.3 (1)		
Having opinion conflict with generally held views	Family	72.5 (50)	57.6 (19)	80.0 (4)	2.618	0.270
	Internet	27.5 (19)	42.4 (14)	20.0 (1)		
Insecurity with bodily appearance	Family	52.4 (22)	47.6 (10)	66.7 (2)	0.416	0.812
	Internet	47.6 (20)	52.4 (11)	33.3 (1)		
Do taking drugs keep one secure	Family	53.6 (15)	27.3 (6)	100.0 (2)	6.077	0.048
	Internet	46.4 (13)	72.7 (16)	0.0 (0)		
Ever experimented with Cigarette	Family	8.3 (1)	56.2 (9)	0,0 (0)	8.156	0.017
	Internet	91.7 (11)	43.8 (7)	100.0 (2)		

Ever experimented with alcohol	Family	65.8 (25)	50.0 (10)	50.0 (2)	1.524	0.467
	Internet	34.2 (13)	50.0 (10)	50.0 (2)		
Assurance of who you will turn out to be	Family	82.4 (84)	79.3 (23)	100.0 (6)	1.477	0.478
	Internet	17.6 (18)	20.7 (6)	0.0 (0)		
Having problems with academics	Family	67.4 (29)	39.1 (9)	37.5 (3)	6.025	0.049
	Internet	32.6 (14)	60.9 (14)	62.5 (5)		

DISCUSSION:

The adolescence age is a time of changes that is associated with rapid changing experience in cognitive and emotional capacity and lots of expressions that are contrary to parental views and these may include avoidance strategies [22]. This study revealed that more than 50% of respondents have difficulty discussing their divergent view of religion with their family. This may be as a result of the changing views that are held by the surge of new teaching about religion through internet usage. The lowest perceived life problem among the respondents is the problem of experimenting with cigarette (10.5%). This finding may indicate that cigarette use is not common among adolescence in the study locality and this may be related to the increased awareness created by government against the dangers of tobacco smoking in Nigeria. Nigeria released the first ever global adult tobacco survey report in 2013 where about 10% of Nigerian men still smoke cigarette and from this figure about 70% planned quitting while 3 out of 10 thought of quitting because of the warning label on the pack. [23] Since fewer adults get involved in cigarette smoking, adolescents who often times imitate adults action in their childhood may be shifting their interest in experimenting with cigarette and thus an added reason why we have the least problems in cigarette smoking. [23]. The total proportion of all the respondents from dysfunctional families was more than a quarter (28.6%) with 25.1% from moderately dysfunctional families and 3.5% from severely dysfunctional families. This may not be far from the fact that the struggle to make ends meet in the family in the atmosphere of poverty had a negative effect on the family. [24] The impact of family dysfunctionality was also observed in the problems the respondents had. About twice the percentage of respondents from severely dysfunctional family (80%) when compared to those from highly functional family had difficulty in knowing what they were meant to do and be. The reason for this finding has been linked to poor access to resources, parental support and good family relationships that adolescents from low family functionality experience. [16] Other findings which follow similar pattern of adolescent problems being significantly associated with severely dysfunctional families when compared with those from highly functional ones include experimentation with cigarette smoking, academic problems, thoughts that taking drugs or living like the 'big boys/girls' guarantee security, choosing a life career and fears/concerns of knowing what the

future holds for them. There is a significant association between parental influence and academic performance. [25] These observations attest to the fact that, it is only when there is highly functional environment in the family that parental influence can be felt on adolescents' care and development. Good support from the family will help adolescents have security from within the family rather than in internet, drugs or following the so called big boys or girls who can easily distract and derange them. In addition, the observation that adolescents from highly functional families sought internet for dangers of taking drugs may not be unconnected with the security and conviviality in their family as this may give room for them to seek clarification from whatever message/content they obtained from the internet where necessary. Adolescents' life satisfaction and psychological well-being has been reported to be statistically related to good family relationship. [26] In like manner, a situation where there is severe dysfunctionality in the family, the adolescent will not have recourse to support that can help him or her to face the future. The adolescent perception of how important they are to their parents' influences adolescents' mental health. [27] Once there is a poor perception of adolescents' importance to their parent, they will naturally not want to discuss something as important as their future with their parents.

It was observed from this study that a larger percentage of respondents from severely dysfunctional family had difficulty following their parent's religion when compared to those from highly functional families. While a larger percentage (60%) from severely dysfunctional families discusses their divergent view of religion in their family, only about a third from highly functional families do same. The reason for this might not be removed from the possible deviant behaviors exemplified by adolescents from dysfunctional families. [22] It has been noted that religious participation is related to the quality of the relationship between parents and children. [28] There is a reduction in domestic violence in families that attend regular church services. [28] The respondents from highly functional family might not be courageous to discuss a divergent view on religion because of the authoritative nature of parents from such homes and the fear of disrupting the unity enjoyed in the family. [24;28]

A look at family functionality vis-a-vis where respondents seek for solution to their problems showed that when the problem of setting of goals was considered, more than half of those from severely dysfunctional families prefer the internet to their family to access solution. This is not surprising because, it has been reported that in a dysfunctional family the parents are busy and non-present with overall results being parental inadequacy. [29] In addition, there is extreme conflict and hostility which does not give room for interaction between the family [29] thus living the adolescent with no other

option than to seek help from other sources like the internet.

In a similar manner, when the concern about meeting parents' expectation were assessed, a greater percentage, about thrice the percentage (71.4%) of respondents from severely dysfunctional family sought for help from the internet against 25.5% who went to internet for help from respondents in highly functional family. In an atmosphere of conflicts and animosity as in a poor dysfunctional family setting, [29] adolescents will find it difficult to know what the parents' expectation is and even more challenging meeting such expectation.

Regarding relationship with opposite sex, a larger percentage of both respondents from highly functional and severely dysfunctional families sought for solution from the internet. On the contrary, a larger percentage of respondents from moderately dysfunctional families sought for solution from their families. Handling relationship with the opposite sex is not limited to family functionality alone. It has been reported that perceived family expressiveness and moral religious emphasis protect the adolescents when sexual matters are concerned. [30] Perhaps the reason why respondents from moderately dysfunctional family had a larger percentage seeking solution from their parents might be because of other factors that play role in handling relationship with opposite sex.

On the contrary, a larger percentage of respondents from highly functional families will go to their families for solution among those with problems of whether taking of drugs and copying other peers will make them secure as opposed to about 27% who sees the family as a source of solution. It has been stated earlier that good family functionality is protective of adolescents' mental health [16,26] Whilst respondents from severely dysfunctional families seek for solution for their academic problems from the internet, their counterpart from highly functional families sought for solution from their families further affirming previous observations that Adolescents from dysfunctional families do not have the requisite environment where they can discuss their academic problems with their parents [22,25,29]. Another reason behind this might be because adolescents from severely functional families often become deviant more so, in a setting where punitive parenting, violence and interparental conflicts are common. [30]

CONCLUSION:

This study concludes that adolescents from dysfunctional families use social media more to access negative information in order to solve their perceived problems or needs. Therefore, all efforts should be geared towards making families more functional in the study locality.

Study limitations:

This study is limited by its being questionnaire based with the possibility of recall bias and respondents not volunteering the total

information as they may want to project a positive image for themselves. Despite this, it highlighted the behaviors of the adolescents (when stratified according to the family functional level with respect to the use of social media for the first time in our study locality and found important factors fueling this practice).

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AWARENESS AND WILLINGNESS TO PAY FOR COMMUNITY HEALTH INSURANCE SCHEME AMONG RURAL HOUSEHOLDS IN EKITI STATE, NIGERIA

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ABSTRACT:
The aims of this study were to assess the awareness and willingness to pay (WTP) for community health insurance (CHI) scheme; and the factors associated with the WTP among rural households in Ekiti State, Nigeria. This cross-sectional study was carried out among 420 households selected through a multi-stage sampling technique. Data was collected using a semi-structured interviewer-administered questionnaire, adapted from a validated tool. The Double-Bounded Dichotomous Choice Model variant of the contingent valuation method was used for eliciting the willingness to pay, with starting bid of 500 Naira per person per month. Data was analysed using STATA v10. Awareness of CHI was low at 23.1%. Half of the respondents (50.5%) who were aware of CHI knew the features. Willingness to join the CHI scheme among the respondents was 71.7%. The mean amount respondents were willing to pay per person per year was ₦6265.31 ± ₦4348.83. Being unemployed (AOR=0.02; CI=0.00-0.912) and knowledge of the benefits of having a health insurance (AOR=24.68; CI=4.52-134.76) were significant predictors of the Willingness to pay. Increased community mobilization and health education intervention on Community Health Insurance should be designed and provided to the communities with emphasis on the role, operations and especially, the benefits of CHI.

Keywords: Community Health Insurance, Willingness to Pay, Universal Health Coverage, Premium, Ekiti State, Naira (Nigerian currency)

INTRODUCTION:

Universal Health Coverage (UHC) has in recent times been on the forefront of the global drive to ensure equity in health care, improved access to health services and financial protection to individual and families in the society. UHC means that all people receive the health services they need, of appropriate quality, without exposing them to financial hardship, which includes avoiding out-of-pocket (OOP) payments that reduce the affordability of services [1,2]. One of its key features is that it includes prepayment and supports risk pooling, which ensures the spread of risk across time

and across individuals. The World Health Organization (WHO) has advised that risk-pooling mechanisms should be used for financing healthcare with the quest to achieve universal coverage, and such is the Community health insurance (CHI) scheme [3,4]. The WHO further reported that CHI schemes play an important role in addressing the issue of inadequate funding of the health system, as well as in UHC [3].

CHI schemes share common characteristics including: not-for-profit prepayment plans, community empowerment, and voluntary membership [5]. Such schemes are consequently becoming increasingly recognized as a viable instrument to finance health care in developing countries [4-6], where there are problems of poverty, poor resources and high burden of disease [7]. There has recently been increased interest in the development of CHI scheme in Low- and Middle-Income Countries (LMIC) such as Nigeria, due to the inequity, poor access to quality health care and financial burden brought about by the reliance on OOP payment option for health care. In sub-Saharan Africa, OOP payments constitute approximately 40% of total health expenditures, and thus imposing financial burdens and limiting access to care in some of the poorest countries around the globe [8,9].

Government allocation to health as a proportion of the annual national budget in Nigeria is still below the minimum of 15% agreed to by African Heads of States and Government in the Abuja declaration of 2001 [10], making OOP spending the greatest source of health care financing. This scenario is similar in other developing economies [11-13]. The National Health Insurance Scheme (NHIS) was introduced in 2005 with the aim of ensuring that every Nigerian has access to good and affordable health care services and that medical cost are distributed equitably among different income groups [14]. Though planned to provide universal coverage to the population in 15-20 years [15], the scheme is yet to provide cover for individuals in the informal sector who form the majority [5] of the populace, and who predominantly live in the rural areas, where the standard of living as well as access to quality health care is poor [16].

Community health insurance has been found to reduce OOP payment thereby helping individuals and households avoid Catastrophic Health Expenditure (CHE) and poverty as a result of seeking health care [8,9,17]. According to the WHO, 150 million people suffer financial catastrophic shock each year in sub-Saharan Africa, and 100 million are pushed into poverty because of direct payments for health services [1]. The WHO 2001 Commission on Macroeconomics and Health recommended that OOP expenditures by poor communities should be redirected into community financing schemes [9] thus serving as an effective means to solving the financial problems of health care for the poor, protecting

poor people from the costs of health care, and leading to greater equity in health financing [18,19]. It has also been shown that there is an increase in utilization of health care services following the implementation of CHI, and subsequently, improvements in health outcomes [18]. Thus there have been drives towards scaling up CHI schemes in Nigeria [5,6,14]. An assessment of the demand or willingness to pay (WTP) for health insurance is very crucial prior to initiating the CHI schemes. Such assessment is important for ascertaining the feasibility, successful implementation and sustainability of community-based health insurance schemes. There are presently very few studies on willingness to pay for CHI in south western region of Nigeria. Findings from this research will provide vital information on health care financing at household level in rural areas in Ekiti State, thus guiding policy makers and stakeholders in formulating CHI policies and planning sustainable CHI scheme in Ekiti State.

The aim of this study was to assess the awareness and willingness to pay for community health insurance scheme and the factors associated with it among rural households in Ekiti State, Nigeria.

METHODOLOGY:

This cross-sectional study was carried out in selected rural settlements in Ekiti State, in the South-western part of Nigeria. Ekiti State has 16 Local Government Areas (LGAs) which are administratively divided into wards [20]. Of the sixteen LGAs, four of them are predominantly urban, four are predominantly rural, and the remaining LGAs are semi-urban [21,22]. The total population of the State as at the time of this study, projected from the 2006 population Census at an annual growth rate of 2.9% was 3,540,321 [22]. Majority of the inhabitants are farmers and traders, especially in the rural areas.

A household is a group of persons who live together in the same dwelling unit and eat from the same pot, and acknowledge one adult member as the head of the household [16]. The household head is the person responsible for leadership and financial decisions. All household heads who are more than 18 years of age, who gave consent to participate in the study, and who had been resident within the State for a minimum of 12 months were included in the study. All subjects who were bedridden at the time of the study were excluded. The minimum sample size was calculated by the Leslie Fischer's formula [23], using a willingness to join value 69.3% [8]. After compensating for 20% non-response, the sample size was rounded up to 420. A multi-stage sampling technique was used to select respondents. During the first stage, LGAs were stratified as Rural, Urban, and Semi-urban LGAs. Two LGAs were selected from the rural group by simple random sampling. In the second stage, two communities were selected using simple random sampling from each LGA.

In the third stage, a sampling frame of all enumeration areas (EAs) in each selected community were drawn using Federal Office of Statistics listing of 2006. Five EAs were selected from each of the communities using simple random sampling by balloting method. In the fourth stage, the list of all the households in each selected EA were generated to produce a sampling frame, and the number of households needed in each EA were selected from the list by systematic random sampling. The household head was then identified and interviewed. Where the head of the household was not at home at the time of the visit, the spouse or another adult within the household was interviewed. If no adult was available, the interviewer moved on to the next household.

Data was collected using a pre-tested, semi-structured interviewer-administered questionnaire. Six research assistants with a minimum basic Ordinary-level education qualification were recruited and trained for the study. They were supervised in the field by three qualified field supervisors. The questionnaire was adapted from a validated tool, the Community Health Plan – Kwara Central Survey 2009 Questionnaire [24]. Pre-test of the questionnaire was done on 10% of the subjects (that is, 40 respondents) in a rural community, which was thereafter excluded from the study. Appropriate corrections were made to the questionnaire after pre-testing. The questionnaire was reviewed by the Consultants in the Department of Community Medicine, Federal Teaching Hospital (FETHI) Ido-Ekiti, to ensure face validity and content validity.

A CHI model, including the benefit package, was described for the respondents before determining their levels of WTP for the scheme. This served as the hypothetical Insurance market that was presented to the respondents. The Double-Bounded Dichotomous Choice Model (DBDC) variant of the contingent valuation method was used for eliciting the WTP. This was supported with open-ended follow-up questions for respondents who were not willing to pay the stated premium, thus enabling respondents to pick lower amounts (as low as zero) or higher amounts (higher than the stated options in the DBDC Method). The use of the DBDC variant helps to reduce response bias. The premium for this study was set on the starting bid of 500 Naira per person per month (6000.00 Naira per annum), based on an average WTP obtained in a study in Ekiti State in 2013, and after accounting for inflation [25]. The completed questionnaires were collated and checked for any errors in filling at the end of each field day. Data analysis was done using STATA, version 10 software packages. A p-value of <0.05 was taken as statistically significant. The exchange rate was taken at 1.0 USD to 397.00 Naira (Nigerian currency). Ethical clearance and approval for this study were obtained from the Ethics and Research Review Committee of the Federal Teaching Hospital, Ido-Ekiti. Written consent

was also obtained from each of the respondents.

RESULTS:

Four hundred and twenty (420) respondents were interviewed. Many of the respondents were in the age range of 30-39 years, 123 (29.3%). Mean age of respondents was 47.1 ± 16.2 years. The proportion of males was higher, 291 (69.3%). Most of the respondents were married, 395 (94.0%) and the prevalent marriage type was monogamous marriage, 308 (78%). Head of households accounted for 75% (315), of the respondents. Most of the households had averagely 5-6 members (38.3%); while the mean household size was 4.9±1.9. About 34% of the households had at least one child below 5 years of age. Also 84 (20.0%) had at least one elderly person over 65 years of age. Most of the respondents were educated, with a higher proportion having post-secondary education, and there were more people in the informal employment. Many of the respondents had average monthly income in the range ₦10000-19999 (Table 1).

Ninety-seven (23.1%) respondents were aware of CHI. More respondents who were aware of CHI heard about CHI mainly from the radio (40.2%), followed by from health workers (22.7%). Half of the respondents 49 (50.5%) who were aware of CHI knew the features of CHI. Sixty percent respondents had knowledge of benefits of having a health insurance. Only 10 (2.4%) of the respondents were presently on Health Insurance. Willingness to join CHI among the respondents was high as 294 (71.7%) respondents were willing to join.

The mean number of household members that respondents were willing to enroll in the CHI scheme was 4.3±1.9. For respondents not willing to join the Insurance Scheme, the commonly cited reason was lack of interest (37.1%); followed by "I'm rarely ill" (15.5%), and "I don't trust insurance" (12.1%).

Table 3 shows the amount respondents were willing to pay per person per year for CHI. Mean Willingness to Pay per person per year was 6265.31 ± 4348.83 Naira. The least amount respondents were willing to pay was 50 Naira. Among the respondents who were willing to pay for CHI, 266 (90.5%) preferred to pay in cash, while 96 (32.7%) preferred to pay their insurance premium at their convenience.

None of the socio-demographic factors and household characteristics was found to be significantly associated with willingness to pay for CHI. Occupation, Knowledge of the features of CHI, Knowledge of the benefits of having a health insurance were however found to be significantly associated with WTP (p= 0.004, 0.001, and <0.001 respectively) (Table 4). Factors significantly associated with WTP were included in the Logistics regression model. The results show that Occupation (AOR=0.02; CI=0.00-0.912) and Knowledge of the benefits of having a health insurance (AOR=24.68; CI=4.52-134.76) were significant predictors of Willingness to pay for CHI.

Table 1: Socio-economic and Household characteristics of Respondents

Characteristics	N = 420 (%)
Average household size:	
1 – 2	33 (7.9)
3 – 4	153 (36.4)
5 – 6	161 (38.3)
>6	73 (17.4)
Mean ± SD (standard deviation)	4.93 ± 1.96
Occupation:	
Unemployed	18 (4.3)
Informal employment	299 (71.2)
Formal employment	103 (24.5)
Educational status:	
No formal education	53 (12.6)
Primary	93 (22.1)
Secondary	149 (35.5)
Post-secondary	125 (29.8)
Average Monthly Income (Naira):	
No income	60 (14.3)
< 10,000	86 (20.5)
10,000 – 19,999	115 (27.4)
20,000 – 29,999	50 (11.9)
30,000 – 39,999	45 (10.7)
40,000 – 49,999	23 (5.5)
50,000 – 59,999	18 (4.2)
≥ 60,000	23 (5.5)

Table 2: Awareness of Community of Health Insurance (CHI), Household Current Insurance Status and Willingness to Join Community Health Insurance

Characteristics	N = 420 (%)
Awareness of CHI?	
Yes	97 (23.1)
No	323 (76.9)
Main Source of information*	**N = 97 (%)**
Friends and family	12 (12.3)
Television	20 (20.6)
Radio	39 (40.2)
Newspaper	3 (3.1)
Health worker	22 (22.8)
Others	1 (1.0)
Knowledge of the benefits of having a health insurance	**N = 420 (%)**
Yes	252 (60.0)
No	168 (40.0)

Benefits of Health insurance scheme identified[1]	**N = 252 (%)**
Affordable	50 (19.8)
Accessible healthcare	128 (50.8)
Prevention from poverty	40 (15.9)
Installment payment	10 (4.0)
Mutual assistance	24 (9.5)
Presently on any form of health insurance	**N = 420**
Yes	10 (2.4)
No	410 (97.6)
Number of Household members presently covered by health insurance	**N = 420 (%)**
0	410 (97.6)
1-2	3 (0.7)
3-4	5 (1.2)
≥5	2 (0.5)
Mean ± SD.	3.60 ± 1.78
Willing to join CHIS*	**N = 410 (%)**
Yes	294 (71.7)
No	116 (28.3)
Number of people in household willing to enrol in CHIS	**N = 294 (%)**
1 – 2	46 (15.6)
3 – 4	117 (39.8)
≥ 5	131 (44.6)
Mean ± SD	4.38±1.96

***=** only respondents who are aware of CHI
[1]**=** only respondents who knows the benefit of having a health insurance
[2]= Respondents not already on Health Insurance

Table 3: Respondents' Willingness to Pay (WTP) per Person per Year for Community Health Insurance and Preferred Mode and Frequency of Payment

Characteristics	**Rural**
WTP (in Naira)	
Mean ± (SD)	6265.31 ± 4348.83
Willing to pay 500 Naira per person per month*	**N = 294 (%)**
Yes	165 (56.1)
No	129 (43.9)
Willing to pay 750 Naira per person per month**	**N = 165 (%)**
Yes	53 (32.1)
No	112 (67.9)
Willing to pay 250 Naira per person per month***	**N = 129 (%)**
Yes	87 (66.7)
No	43 (33.3)
Preferred mode of payment for insurance premium*	**N = 294 (%)**
Cash	266 (90.5)
Taxes	7 (2.4)
Cooperatives	6 (2.0)
Agric commodities	15 (5.1)
Preferred frequency of payment of insurance premium*	**N = 294 (%)**
Monthly	139 (47.3)

Quarterly	30 (10.1)
Annually	29 (9.9)
At convenience	96 (32.7)

N.B: * Only respondents who were willing to pay for CHI;
** Only respondents who were willing to pay 500 Naira
*** Only respondent who were not willing to pay 500 Naira

Table 4: Factors associated with Willingness to Pay (WTP) for Community Health Insurance (CHI)

Characteristics	WTP n = 294 (%)	Not WTP n = 116 (%)	Statistics, p value
Gender			$\chi2$= 0.396; 0.529
Male	201 (70.8)	83 (29.2)	
Female	93 (73.8)	33 (26.2)	
Marital status			
Never Married	17 (73.9)	6 (26.1)	$\chi2$=0.058 ; 0.809
Married	277 (71.6)	110 (28.4)	
Average household size			
1 – 2	21 (70.0)	9 (30.0)	$\chi2$= 2.110 ; 0.550
3 – 4	104 (69.8)	45 (30.2)	
5 – 6	121 (75.6)	39 (24.4)	
>6	48 (67.6)	23 (32.4)	
Number of children <5years of age			
0	138 (70.4)	58 (29.6)	
1	104 (73.2)	38 (26.8)	$\chi2$= 2.527 ; 0.470
2	48 (75.0)	16 (25.0)	
>2	4 (50.0)	4 (50.0)	
Number of elderly > 65 years of age			
0	215 (73.4)	78 (26.6)	
1	58 (69.0)	26 (31.0)	$\chi2$= 1.756 ; 0.416
2+	21 (63.6)	12 (36.4)	
Marriage type	n = 277 (%)	n = 110 (%)	
Monogamous	218 (72.4)	83 (27.6)	$\chi2$ = 0.480 ;
Polygamous	59 (68.6)	27 (31.4)	0.488
Occupation			
Unemployed	11 (61.7)	7 (38.9)	$\chi2$=10.815; 0.004
Informal employment	204 (68.2)	95 (31.8)	
Formal employment	79 (84.9)	14 (15.1)	
Educational status			
No formal education	33 (62.3)	20 (37.7)	
Primary	63 (67.7)	30 (32.3)	$\chi2$= 4.480; 0.214
Secondary	109 (74.7)	37 (25.3)	
Post-secondary	89 (75.4)	29 (24.6)	
Income			
No income	35 (58.3)	25 (41.7)	$\chi2$= 11.953 ;
< 10,000	60 (69.8)	26 (30.2)	0.102
10,000 – 19,999	82 (71.3)	33 (28.7)	
20,000 – 29,999	35 (72.9)	13 (27.1)	
30,000 – 39,999	36 (85.7)	6 (14.3)	
40,000 – 49,999	19 (82.6)	4 (17.4)	
50,000 – 59,999	14 (82.4)	3 (17.6)	
≥60,000	13 (68.4)	6 (31.6)	

DISCUSSION:

Awareness of CHI in this study was found to be low; despite the presence of CHI scheme in two communities in the state. Only a little above one-fifth of the respondents were aware of CHI. The general low level of awareness could translate into poor interest in enrolment and less demand for CHI [26,27]. Previous studies showed awareness rate of 37.8% and 25.6% reported in rural communities in North central Nigeria [27], and Cameroon [26] respectively. Low awareness levels underlie the need for increased media campaign on CHI and for more work to be done in educating the communities, especially in sub-Saharan Africa.

More respondents who were aware of CHI heard about CHI from the radio, and from health workers. This compares with previous studies where the mass media and health workers were also most commonly mentioned as sources of information about CHI [26-28]. These findings highlight the vital role health workers have to play in community mobilization and increasing households' awareness of CHI.

About 60% of the respondents could identify a potential benefit of CHI. The respondents identified CHI with increased access to healthcare, and affordable healthcare, which are important components of UHC [2]. This implies that with appropriate sensitization, households in Ekiti State will not only understand the concept and benefits of CHI, they can be effectively mobilized towards accepting, and enrolling in CHI schemes.

Willingness to join CHI was high, as 71.7% of the respondents were willing to join CHI. Though this study reported a low level of awareness of CHI, the high willingness to join reported may be due to the respondents' perceived benefits of having an insurance cover as almost two-thirds of the respondents perceived that having a health insurance was beneficial, and not necessarily because they have a good understanding of the health insurance process. This finding compares with studies in rural Ecuador and Ethiopia [8,13,29]. The result of WTJ from this study is higher than the WTJ reported in a study in India in which 11.9% of the respondents were ready to buy health insurance without any conditions and 19.8% were willing to buy only if certain conditions are fulfilled [28]. The higher WTP in this study could be because of the prevailing economic situation in the country as at the time of this study, with the communities recognizing CHI as a way to affordable health care.

It was also found in this study that the mean number of family members that the households were willing to enrol in CHI schemes was 4.3±1.9. This number is 87.7% of the average family size of the rural households. The implication of this is that some of the household heads were not willing to enrol their entire household members in CHI scheme. This was however higher than the findings reported by

Le-May Boucher in a study in Senegal [30]. Moreover, we found that in households which were presently on Health Insurance (NHIS), averagely 3.6±1.7 household members were enrolled in the Scheme. Household heads deciding not to enrol all the members of their families may be because of the financial implications of enrolment, and may also be because of the extended family nature of many of the families in Nigeria, in which not every member of the household are actually members of the nuclear family; this being especially true in the rural areas.

For respondents not willing to join the Insurance Scheme, it was found that the commonly cited reason was lack of interest and "I'm rarely ill". In a similar study on WTP for social health insurance among teachers in south Ethiopia, it was found that for those not willing to join the scheme, the two most commonly stated reasons were fear of poor implementation and that the scheme might not cover all needed services [13]. The lack of interest and lack of trust in the scheme may be due to poor awareness and understanding of community health insurance scheme earlier reported in this study. This underlies the need for more health education of the populace on the role, benefits and mode of operation of CHI schemes.

This study found that the mean Willingness to Pay per person per year was ₦6265.31 ± ₦4348.83. This was the affordable price at which the households were willing to convert their out-of-pocket health expenditures into pre-paid health expenditure. The mean annual WTP in this study was higher than the mean WTP for urban (₦1,798.90k ± 134.7 per person per year) and rural households (₦721.70k ± 250.5 per person per year) in a study in Osun State [12], as well as in rural (₦3,000 per person per year), and urban (₦4,116 per person per year) households in Anambra and Enugu State, Nigeria [31]. These differences could be due to the difference in time of elicitation of the WTP in these other studies, as inflation would have occurred over the years.

Majority of the respondents who were willing to pay for CHI preferred to pay in cash. This finding is unlike that reported in a study in south western Nigeria in which it was found that rural households preferred to pay in kinds, while urban households preferred the use of cash [32]. The use of cash may be seen by many of our respondents to be more convenient, and less prone to abuse. This study also found that less than half of the respondents who were willing to pay for CHI preferred to pay their insurance premium on a regular monthly basis, while about one-third preferred to pay their insurance premium at their convenience. This compares with a study in Malawi where 85.6% of the respondents preferred to pay on a monthly basis [33]. This finding may be due to the inconsistent nature of income for individuals and households in the

informal sector, to which many of our respondents belong.

This study found out that factors significantly associated with WTP included occupation, knowledge of the features of CHI and knowledge of the benefits of having a health insurance. Occupation and Knowledge of the benefits of having a health insurance were significant predictors of Willingness to pay. The unemployed were 98% less likely to be willing to pay for CHI than those who were in the formal employment. Also, those who knew the benefits of having a health insurance were 24 times more likely to be willing to pay for CHI than those who did not know the benefits. This finding may be because the employed have a regular source of income, thus would be able to afford insurance and pay premium without default. Also, knowledge of benefit of having a health insurance could imply willingness to appropriate such benefits by being willing to pay for CHI. The implication of this is that Health education intervention be targeted at the unemployed, with emphasis on the benefits of having a health insurance.

CONCLUSION:

The awareness of CHI was low in this study, and the mass media was the main source of information, however there was high willingness to join CHI, showing that CHI is feasible in Ekiti State. The mean Willingness to Pay per person per year was found to be 6265.31 ± 4348.83 Naira. Occupation and Knowledge of the benefits of having a health insurance were significant predictors of Willingness to pay. We therefore recommend increased community mobilization and awareness about CHI in the State through the mass media and the health workforce, with health education intervention on CHI designed and provided to the communities with emphasis on the role, operations and especially benefits of CHI.

The policies of CHI in the State should be made to focus on the unemployed, and those in the informal sectors in the rural area, while strengthening the communities and providing technical support towards forming sustainable CHI schemes. We also recommend further research, especially qualitative study to assess the reasons for the lack of interest in CHI or fear of failure/poor implementation of CHI as expressed by respondents in this study.

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COMPETING INTEREST:

The authors declare that they have no competing interests.

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ASSESSMENT OF THE AWARENESS AND PREPAREDNESS FOR MENACHE AMONG FEMALE STUDENTS IN SECONDARY SCHOOLS IN ILE-IFE, OSUN STATE NIGERIA

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Running Title: Preparedness for menarche among girls
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ABSTRACT:
Generally, the mean age at menarche appears to be falling, and many girls attained menarche unprepared. This study assessed the preparedness of female secondary school students in Ile-Ife in Osun State towards menarche. This cross–sectional descriptive study was carried out among 797 female students selected through multistage sampling method. Semi-structured, self-administered pretested questionnaires were used as research instrument. Data was analyzed using the Statistical Package for Social Sciences software version 23.0. Mean age of respondents was 18.4 ± 2.7 years. A total of 89.6% (714) of all the respondents were informed about menarche before its onset; 73.2% (527) of them were informed by their mothers. About 69.3% of the respondents had good knowledge score of menarche while only 65.9% of them were scored as prepared for menarche. Predictors of being prepared for menarche include higher age at menarche, and being pre- informed about menarche.
There is still need to fill the existing knowledge gap among the respondents through adequate school health education program.

Keywords: Menarche, Secondary school adolescents, menstruation, preparedness.

INTRODUCTION:

The period of adolescence in a girl is a critical and important period that usually witnesses the first menstruation, usually referred to as menarche. It is one of the major events of puberty, usually occurring between the ages of 10 and 16 years [1]. Few years before menarche, the production of sufficient gonadotropin acts on the uterine endometrium and paves the way for the first menstruation [2]. Mean age at menarche appear to be falling, most especially in developed countries [3,4], the same may not expressly be said of developing countries due to paucity of data. However, a study conducted in Nigeria has reported higher age of menarche for girls from the low socio-economic group and a lower age for those from the higher socio-economic group, with a mean age of about 13 years [5].

In many Nigerian secondary schools, the biology and physiology of the reproductive system are taught only to science students. However, the menstrual cycle and the practical management of menstruation are often considered as a matter of secrecy and inappropriate for public discussions [6]. This encourage unnecessary beliefs, myths, and superstitions surrounding the menstrual cycle as female students are left to find out information on their own, most especially from the social media. Whereas the veracity and reliability of these internet sources cannot be determined, situation is worsened by the non-formal teaching of family life health education in secondary schools in Osun State, Nigeria. This is an avenue in the state for adolescents to learn about reproductive health, menstruation and menstrual hygiene. As adolescents enter puberty uninformed and unprepared, this pattern may have far reaching impact on how they manage their subsequent menstrual cycles and the reproductive health period that follows. This study therefore assessed the awareness and preparedness for menarche among adolescent girls in secondary schools in Ile-Ife in Southwestern Nigeria

METHODOLOGY:

This was a descriptive cross sectional institutional based study carried out among female students in secondary schools in Ile-Ife, Southwestern Nigeria.

Ile-Ife is a city in south-western Nigeria, with a total population of about 300,000 going by a projection of the 2006 National Population Census [7]. There are two local government areas (LGA) within the city. Secondary schools are either owned by private individuals or by government. There are a total of eight secondary schools within the city.

The study population constituted all female secondary school students in the senior classes of selected schools; only registered in-school students were included. Students from private secondary schools were excluded from the study, because of administrative bottleneck.

The sample size was calculated using the Modified Leslie Fisher's formula [8]. A sample size of 748 was obtained based on a p-value of 0.5, considering Z alpha and Z beta to be 1.96 and 0.84, respectively [9]. This was rounded up to 800 to cater for cases of attrition and non-responses.

A multistage sampling method was adopted in sample selection. In the first stage, two of the four local government areas (LGAs) in the city were selected by simple random sampling. In the second stage, a list of secondary schools in each of the two LGAs was obtained from the local inspectorate of education. Two schools were randomly selected using simple random sampling. In the third and fourth stages, respondents were randomly selected from four classes in a total of eight eligible senior secondary schools.

Questionnaires were equally allocated to each of the LGAs, school, level and class. Considering an average of 40 students in a class, a list or sampling frame (through numbering of students) that were present on the day of data collection and as they sat in the class was prepared. A systematic sampling of one in three numbered students was drawn and these were subjected to the research instrument. This continued until the questionnaires allocated to that class were exhausted. In classes where questionnaires were not exhausted, another level was chosen using simple random sampling and participants recruited in the same way.

Semi structured self-administered pre-tested questionnaires were used for data collection. The questionnaires were pre-tested among 60 secondary school students in a Government school in Ibadan in Oyo state. The study variables included socio-demographic data, pre-menarchial events and experiences and preparedness for menarche.

Ethical clearance for this project was obtained from the Osun State Ministry of Health research ethical review committee. The heads of the selected schools also gave permission to conduct the study; written informed consent was obtained from each of the selected female students.

The Statistical Package for Social Sciences (SPSS) software version 23.0 was used for data analysis after validating data entered through manual random checks and double entry.

Questions related to knowledge was scored accordingly with score 1 given to right knowledge for those with "Yes" response and score 0 given to wrong knowledge for those with "No" response. Total score on knowledge was computed and mean score determined. Respondents with scores equal to and above the mean were classified as having adequate knowledge while those below the mean score were classified as having inadequate knowledge. Preparedness was scored in a similar way by pulling together all the questions related to preparedness. The Chi-square test was used to demonstrate relationships

between categorical variables. Binary logistic regression model was used for multivariate analysis to determine the strength of associations reported while level of significance was set at P-values ≤0.05 for all inferential analysis.

RESULTS:

Of the 800 questionnaires distributed a total of 797 (99.6%) were retrieved from the respondents and found suitable for analysis. This gave a non-response rate of 0.4%. Table 1 shows the socio-demographic characteristics of respondents. The mean age of respondents was 18.4 ± 2.7 years and the age range was 10-19 years. A total of 94.5% (752/797) were single; the mothers of 63.6% (507/797) of the respondents had more than secondary school education attainment.

Table 2 shows the pre-menarchial information received and preparedness for menarche by respondents. The results indicate that majority 89.6% (714) were informed about menarche before its onset. Of these, 73.8% were informed by their mothers. 75.1% stated that their response to what they were told was used to prepare their mind for menarche.

Considerable proportion (70.6%) of the respondents said they informed their mother when they started seeing their menstruation, 21.8% informed their sisters while few1.0% informed their father. Only (23.1%) said they were celebrated at home when they first had their menses. About (57.0%) of them said they felt happy when they started menstruating while (67.5%) said they planned not eating or drinking sugary things during their first menses. Close to one third (24.4%) of them said they planned taking some school leave days once menarche sets in, while (19.1%) said they were prepared to skip visiting religious places once menarche starts, including avoiding sexual intercourse (88.3%). Finally, 65.9% (525) of the respondents were prepared.

Table 3 shows the respondents knowledge of menstruation and menstrual hygiene where higher proportion (88.7%) of the respondents knew that menstruation is not a disease. Only few of the respondents (16.9%) opined that pregnant women menstruate. While only few claimed that menstrual blood comes from the stomach where food is digested, more than half 619(77.7%) of the respondents said that menstrual blood comes from the womb. A larger percentage (96.0%) said that mature girls experience monthly/ cyclical flow of blood (menstruation) as well as

(92.1%) said they know that sanitary products exist for menstrual protection. A higher proportion 703(88.3%) said they were aware that poor menstrual hygiene predispose people to infection. However, about (75.4%) stated that they prepared standby commercial sanitary pads to collect menstrual blood during menarche. While majority 705 (88.5%) said they were prepared for the expected change of menstrual sanitary materials, only 36.8% opined that the ideal method of disposing used

menstrual material is by burning. The mean knowledge score as reveled in Table 3 shows that 69.3% of the respondents had good knowledge scores of menstruation and menarche

The statistical analysis of the data is presented in Table 4. There was no statistically significant association between preparedness for menarche and age at menarche (p = 0.074), and mother's education level (p= 0.501). A statistically significant association was found between preparedness for menarche, and age of respondents and having ever being informed about menarche before it sets in (p= 0.006). No statistically significant association was found between knowledge score and age at menarche (P = 0.257), mothers' education (P = 0.361) and ever being informed about menarche (P =0.545).

Binary logistic regression analysis indicated that there was no difference in likelihood of preparedness for menarche among respondents whose mothers had primary education compared to those whose mothers had higher than primary level education. This observation was found not to be statistically significant (OR: 0.9, 95%CI: 0.457-1.689, P = 0.501). Respondents who commenced menarche between 17 and 19 years were one and a half times more likely to be prepared for menarche compared to those who commenced menarche between 10 and 16 years. This observation was found not to be statistically significant. (OR: 1.5, 95%CI: 0.913-2.375 and P = 0.112). Respondents who were pre-informed about menarche before it sets in were about six times more likely to be prepared compared to those who were not informed/ this observation was also found not to be statistically significant (OR: 5.8, 95%CI: 0.693 – 2/019 and P = 0.265).

Respondents who commenced menarche between 17 and 19 years were one and a half times more likely to have good knowledge of menarche and menstruation compared to those who commenced menarche between 10 and 16 years(OR: 1.6, 95%CI: 0.560-4.790 and P = 0.189). Respondents whose mothers education was above primary were 1.3 times more likely to have good knowledge of menarche and menstruation compared to respondents whose mothers education was just primary (OR: 1.3, 95%CI: 0.689-2.319 and P = 0.361). Respondents who were pre-informed about menarche before it sets in were four times more likely to have good knowledge of menarche and menstruation compared to those who were not informed. This observation was also found not to be statistically significant (OR: 4.3, 95%CI: 0.471-1.739 and P = 0.545).

Respondents who had their first sexual intercourse at age 17-19 years were about five times more likely to have good knowledge of menarche and menstruation compared to those who had their first sexual intercourse at age of 10-16 years. This observation was found not to be statistically significant (OR: 5.4, 95%CI: 0.001-1.196 and P = 0.132). Thus, the

predictors of being prepared for menarche included higher age at menarche and being pre- informed about menarche before its onset. Predictors of good knowledge about menarche and menstruation include higher age at menarche, having a more educated mother, being pre-informed about menarche and having age at first sexual intercourse at a later period of adolescence.

Table 1: Socio-demographic characteristics of female secondary school students in Ile-Ife (N=797)

Variables		% (n)
Age range in years	10-13	3.5 (28)
	14-16	44.5 (355)
	17-19	51.9 (414)
Names of Classes	Junior Secondary School 3 (JSS 3)	9.5 (76)
	SSS 1	27.2 (217)
	SSS 2	28.0 (223)
	SSS 3	35.3 (281)
Marital Status	Single	94.5 (752)
	Engaged/married	5.5 (45)
Religion	Christianity	82.8 (660)
	Islam	15.1 (120)
	Traditional African Religion	2.1 (17)
Educational Status of mothers	Primary school	8.5 (68)
	Secondary school	27.9 (222)
	Above secondary school	63.6 (507)
Monthly Income of parent {Currency: Naira; One Naira = USD)	below N50000	29.5 (235)
	N50000 to N100000	34.5 (275)
	Above N100000	36.0 (287)

Table 2: Awareness and preparedness for menarche

Variables		% (n)
Were you foretold or informed about the coming of a menstruation before its onset (n = 797)	Yes	89.6 (714)
	No	10.4 (83)
Who informed you (n=714)	Mother	73.8 (527)
	Sister	17.2 (123)
	Father	0.4 (3)
	Friend	8.5 (61)
What was your response to what you were told (n=714)	Discarded it	6.4 (46)
	Prepared your mind	74.9 (535)
	Got scared	18.6 (133)
When you started menstruating, did you tell anyone (n = 797)	Yes	90.2 (719)
	No	9.8 (78)

Who did you tell (n=719)	Mother	70.7 (508)
	Sister	21.8 (157)
	Father	0.97 (7)
	Friend	6.5 (48)
Were you celebrated at home when you first had your menses (n = 797)	Yes	23.1 (184)
	No	76.9 (613)
Have you started ever menstruated (n =797)	Yes	93.4 (744)
	No	6.6 (53)
Age at first ever menstruation (n = 744) (mean age 13.5 ± 4.9 years)	10-13	17.3 (129)
	14-16	71.8 (534)
	17-19	10.9 (81)
How did you feel when you started menstruating (n = 797)	Happy	57.0 (454)
	Sad	21.5 (171)
	Ashamed	21.6 (172)
Do you plan not to eat or drink sugary foods at the onset of menarche? (n = 797)	Yes	67.5 (538)
	No	32.5 (259)
Do you plan to take some school leave days once menarche sets in (n = 797)	Yes	24.4 (194)
	No	75.6 (603)
What are the things you feel you would skip once menarche sets in (n = 797)	Visit religious place	6.5 (52)
	Touch growing plants	4.8 (38)
	Nothing	0.5 (4)
	Sexual intercourse	88.2 (703)
Mean preparedness score	Good	65.9 (525)
	Poor	34.1 (272)

Table 3: Knowledge of menstruation and preparedness among respondents (N=797)

Items	Parameters	Percentage (n)
Menstruation is a disease	Yes	11.3 (90)
	No	88.7 (707)
Pregnant women menstruate	Yes	16.9 (135)
	No	83.1 (662)
Menstrual blood comes from the stomach where the food is digested	Yes	18.1 (144)
	No	81.9 (653)
Menstrual blood comes from the womb	Yes	77.7 (619)
	No	22.3 (178)
Mature girls experience monthly/ cyclical flow of blood (menstruation)	Yes	96.0 (765)
	No	4.0 (32)
Pain during menstruation means that someone is sick	Yes	15.7 (125)
	No	84.3 (672)
It is harmful for a woman's body if she runs or dances during her period	Yes	21.7 (173)
	No	78.3 (624)
There are sanitary products for menstrual protection	Yes	92.1 (734)
	No	7.9 (63)
Poor menstrual hygiene predisposes to infection	Yes	88.2 (703)
	No	11.8 (94)
The following should normally be used to collect menstrual	Rag	2.3 (18)

blood	Homemade pads	16.1 (128)
	Commercial sanitary pads	75.4 (601)
	Others	6.3 (50)
Hands-washing is recommended after each clean up	Yes	94.0 (749)
	/No	6.0 (48)
The following are ideal methods of disposing used menstrual material	By burning	36.8 (293)
	Throw into waste bin	33.1 (264)
	Drop in pit latrine	24.7 (197)
	Washing, drying & reusing	5.4 (43)
Knowledge score	Good	69.3 (552)
	Poor	30.7 (245)

Table 4: Associations between socio-demographic data and preparedness for menarche and knowledge of menarche and menstruation

Variables	**Preparedness for menarche N (%)**					
	Good	**Poor**	**X^2**	**P value**	**OddsRatio**	**P value**
Age at menarche						
10-16*	103(79.1)	27(20.9)	2.547	0.074	1.5	0.112
17-19	523(84.8)	94(15.2)				
Mothers education						
Primary*	53(77.9)	15(22.1)	0.016	0.501	0.9	0.501
> primary	573(78.6)	156(21.4)				
Pre- informed about menarche						
No*	563(78.9)	151(21.1)	0.228	0.006	5.9	0.265
Yes	63(75.6)	20(24.4)				

Variables	**Knowledge score N(%)**					
	Good	**Poor**	**X^2**	**P value**	**OddsRatio**	**P value**
Age at menarche						
10-16*	24(85.7)	4(14.3)	0.831	0.257	1.6	0.189
17-19	604(78.5)	165(21.5)				
Mothers education						
Primary*	52(76.5)	16(23.5)	0.241	0.361	1.3	0.361
> primary	576(79.0)	153(21.0)				
Pre- informed about menarche						
No*	559(78.3)	155(21.7)	1.215	0.545	4.3	0.545
Yes	69(82.9)	14(17.1)				
Age at 1st sexual intercourse						
10-16*	97(75.2)	32(24.8)	1.538	0.132	5.4	0.132
17-19	494(80.1)	123(19.9)				

*Reference category

DISCUSSIONS:

Majority of the respondents were informed about menarche by their mothers, and they also informed their mothers when it eventually commenced. These findings support those of other similar studies [10-12]. Mothers traditionally appear to be in the best position of proximity with their daughters in matters like these that are usually regarded as secret and private. The society may blame mothers when their daughters are misguided in matters of sexual and reproductive health because they are naturally expected to fill in such gaps within the society [13].

The mean age of menarche in our present study supports other studies in which mean age at menarche was 13.7 years [10,14]. However, these figures were higher when compared to the mean age of 12.3 years reported by Padez [15].

A worrisome trend was the young mean age at sexual intercourse coupled with poor use of condom, at last sexual intercourse, among majority of the respondents in our present study. This was in agreement with a similar study, by Thomas et al [10]. They reported that 61% of the 1,100 girls already had sex for the first time, with a slightly higher mean age at first sexual intercourse of about 16 years [10]. This result portrays great consequences for adolescents because they are at high risk of being pregnant while in school, at higher risk of contracting Sexually Transmitted Infections from sexual partners, at higher risk of facing an induced abortion and dropping out of school.

About two thirds of the respondents in our study had good knowledge on menstrual preparedness. This is similar to the findings by Balqis et al [16], but different when compared to other studies [17, 18] in which majority of the respondents were assessed to have inadequate knowledge.

Authors are of the opinion that when a girl is well aware and knowledgeable about an upcoming event, it is not surprising if she becomes well prepared for the event and should be able to manage such event better when it would eventually come. In this day of internet which adolescents have good access to, they might have sourced for information on menarche from the social media towards allaying their fears and anxiety on the subject matter.

A little below two thirds of the respondents in our study were well prepared for menarche while the remaining one third were not. This supports the findings in another study [19] in which only one third were reported to be unprepared for menarche. These were different when compared to other studies in which majority of their respondents were assessed to have inadequate preparation for menarche [12,17,18,20].

The high level of preparedness in this study could be as a result of high level of respondent's knowledge which could be a good

omen for good menstrual hygiene practices among the girls in future.

About half of the respondents said they felt happy when menstruation started, only a few said that they were prepared and eventually though, had some restrictions, such as not being able to go to religious places or schools. These findings are not surprising and may not be unconnected with the high level of pre-menarchial knowledge obtained by our respondents and the resulting preparedness. In a similar study [9, 21], fear and anxiety were the feelings that are associated with the coming of menarche. In yet another study, [19], majority of respondents had restrictions, though the study was conducted in a highly religious and traditional area where cultural and religious taboos may have contributed to the differences in reports presented. The relatively high age at menarche and being informed (mostly by mothers) about menarche before its onset were predictors of good preparedness for menarche in our present study. These findings were similar to other studies [12,14]. Invariably, it is expected that educated mothers are more likely to give accurate and detailed information to their daughters on when and what to expect once menarche sets in, partly because she is also knowledgeable about it. Thus, it can be assumed that older adolescents are more likely to have interacted with their friends, have better access to the internet or social media and could have read menstruation related information in the books compared to younger adolescents. This underscores the need for mothers to get close to their daughters as soon and early as possible to acquaint them with correct information about menarche and management of menstruation.

CONCLUSION:

The results obtained indicated that a significant proportion of the respondents had knowledge gaps and were not prepared for menarche. Invariably, there is still need to fill the existing knowledge gap among the respondents through adequate school health education program. The sources and content of the information on menarche received by respondents could determine their level of preparedness, hence parents should be close to their girls in order to be able to give correct information and allay their fears and anxiety on menarche

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Contributions of authors:

WO conceived the idea, wrote the concept note and took part in the whole process. OA took active part in data collection; all others were involved in the writing and review process.

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COMPUTED-TOMOGRAPHY STAGING OF BREAST CANCER AND IT'S ROLE IN PATIENT MANAGEMENT IN A RESOURCE-LIMITED SETTING: A RETROSPECTIVE STUDY FROM FIJI

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ABSTRACT:
Breast cancer is now the leading cause of mortality from cancer in Women in Fiji. State of the art diagnostic measures such as MRI, PET scanning and advanced tumour markers are unavailable in many LMIC countries including Fiji, but CT is becoming more widely available. The aim of the study was to determine the association between CT/anatomical staging and prognosis in a resource-limited setting, and its role in planning appropriate treatment strategies. This was a retrospective, analytical study of the data from the Colonial War Memorial Hospital Oncology department tumour register recorded between 2013 and 2018. The mean age of the breast cancer patients with confirmed diagnosis was 54.93 years with SD of 12.4 years. There was a 40% 3 year mortality rate. CT reports were available for 196 patients. Poor prognosis was very closely associated with Tumour size (p=0.002, OR 0.26 (0.10-0.63)), Nodes (p<0.001, OR 0.25 (0.13-0.48.)) and Metastases (p<0.001, OR 0.13 (0.07-0.25)).The lungs were the most frequent site of metastases. CT staging enables accurate TNM classification, which is closely associated with prognosis. In the absence of advanced cytopathological and imaging modalities CT staging has an important part to play in planning appropriate treatment.

Keywords: CT/anatomical staging, breast cancer, prognosis, Fiji.

INTRODUCTION:

Breast cancer is a major cause of mortality and morbidity worldwide with 1 in 8 women developing an invasive breast cancer during their lifetime [1,2]. In 2018 WHO reported that breast cancer accounted for 1.81% of total deaths in Fiji with an age-adjusted death rate of 26.21 per 100,000 of population, which ranks Fiji number 12 in the world [3]. A recent survey reported 187 breast cancer cases between January 2019 and August 2020; 63% of whom did not receive any treatment [4].

Facilities for diagnosing and treating patients with breast cancer in Fiji are limited. There are no Magnetic Resonance Imaging (MRI) or Positron Emission Tomography (PET) scanning facilities. Hormone receptor status tests are only sporadically available and other tumour marker and genetic testing is not routinely available. There is limited access to CT scans and mammography. Staging CT can be done but timely interpretation and reporting is a significant hurdle. These constrains make the role of breast cancer staging unclear. There is no set protocol or consensus on how and when to stage and on which patients.

In Fiji, as in many other Low Middle Income Countries (LMIC), many patients present late, with large fungating breast masses or evidence of metastasis (bone pain, shortness of breath, cachexia) when palliative care is all that can be offered. Early diagnosis is key to good outcome and this is particularly the case where access to and quality of chemotherapy is limited and radiotherapy unavailable.

Clinical TNM staging describes the local involvement of the breast (T), regional lymph nodes (N) and distant metastases (M). This incorporates imaging findings. Clinical staging can then be incorporated into anatomical staging which ideally includes histologic grade for invasive cancers and the status of the human epidermal growth factor receptor-2 (HER2), estrogen receptor (ER), and progesterone receptor (PR) expression.

Prognosis is related to stage.

The aim of the study was to determine the association between CT/anatomical staging results in breast cancer and prognosis in a resource-limited setting

METHODOLOGY:

This was a retrospective, analytical study exploring the association of CT staging of breast cancer with patient outcome 3 years post diagnosis. It was conducted in Colonial War Memorial Hospital (CWMH) in Suva, the central referral hospital of Fiji,

The Oncology Department Cancer Registry was searched for the details of all patients listed with a diagnosis of Breast Cancer between 2013 and 2018. Clinical records including outcome 3 years post diagnosis were obtained from the Hospital Patient Information system (PATIS). Of the 440 patients listed 348 (79.1%) were confirmed and of these 40.2% (140/348) had no record of CT.

Recorded CT results were not available for 12 of the 208 patients leaving a study group of 196 patients. Details of pathological classification, presence of receptors and details of chemotherapy and surgical treatment were documented where available. Tumour size and presence of Nodes and Metastases were recorded using standard TNM classification [5].

Data was entered onto an Excel spread sheet. Excel was used to derive basic demographic data and Open Epi software was used to determine differences in binary data with Chi squared tests and to calculate Odds Ratios and

95% confidence intervals for the associations between TNM characteristic and outcome at 3 years.

Ethics approval was granted by the post-graduate ethical committee of the CWMH and the University of Papua New Guinea (UPNG) School of Medicine and Health Sciences (SMHS) Research and Ethics committee. Approval to use the data in the oncology registry and hospital PATIS system was given by the Superintendent of CWMH.

RESULTS:

Of the initial 440 patients, four (0.9%) were males. Two of them were excluded from the study due to refusal of further treatment and unavailability of pathological confirmation whilst the other 2 did not have staging CT scan. Eighty four (19.1%) patients did not turn up for clinics or refused treatment after initial diagnosis. and 34 (7.7%) patients were listed for palliative care.

Demographic data was available for 348 (79.1%) patients. Age ranged from 24-87 years with a mean (SD) of 54.9 (12.4) years and a normal distribution across age groups as shown in Figure 1. The youngest patient was one of several patients with bilateral breast cancer.

Of the 348 patients, 207 (59.5%) were alive at the end of 3 years. Laterality of the tumour site was recorded in 186 of the 207 patients. Ninety two (49.5%) affected the right, 90 (48.4%) the left and 4 (2.2%) both breasts.

Data concerning treatment given to the patients was not adequately entered in the hospital PATIS records and data in the oncology records was insufficient for analysis. Histopathology reports on PATIS were sporadic and when present diagnosis was usually “carcinoma”. Only 4 (1%) patients had reports on ER and PR status. Three of these four patients were ER/PR positive and died within 3 years. The fourth patient who was ER/PR negative had CT staging of $T_3N_1M_1$ also died within 3 years. No one had a record of an HER2 result.

Whist CT was available for 196 (56%) of the 348 patients Tumour grade was not indicated in 84 (43%) and presence of Nodes was not indicated in 6 (3%).

Patient outcome (survival at 3 years after initial diagnosis) is shown for those with available data in Table 1. The Association between the TNM classifications and survival is shown in Table 2. In the absence of other prognostic factors, the CT staging shows very close associations between larger tumours, the presence of nodes and the presence of metastases with poor outcome. The presence of metastases was the strongest association with mortality. Metastases were in the lungs (plus or minus other sites) in 77 of 80 patients as shown in Table 3.

Table 1: TNM classification and survival

Tumour	Alive N (%)	Deceased N (%)	Node	Alive N (%)	Deceased N (%)	Metastases	Alive N (%)	Deceased N (%)
0	1 (2)	0 (0)	0	62 (55)	18 (23)	0	90 (79)_	27 (33)
1	7 (11)	3 (6)	1	46 (41)	49 (64)	1	24 (21)	55 (67)
2	20 (31)	5 (10)	2	2 (2)	4 (5)			
3	15 (23).	8 (17)	3	3 (3)	6 (8)			
4	21 (33)	32 (67)						
Total	64 (100)	48 (100)	Total	113 (100)	77 (100)	Total	114 (100)	82 (100)

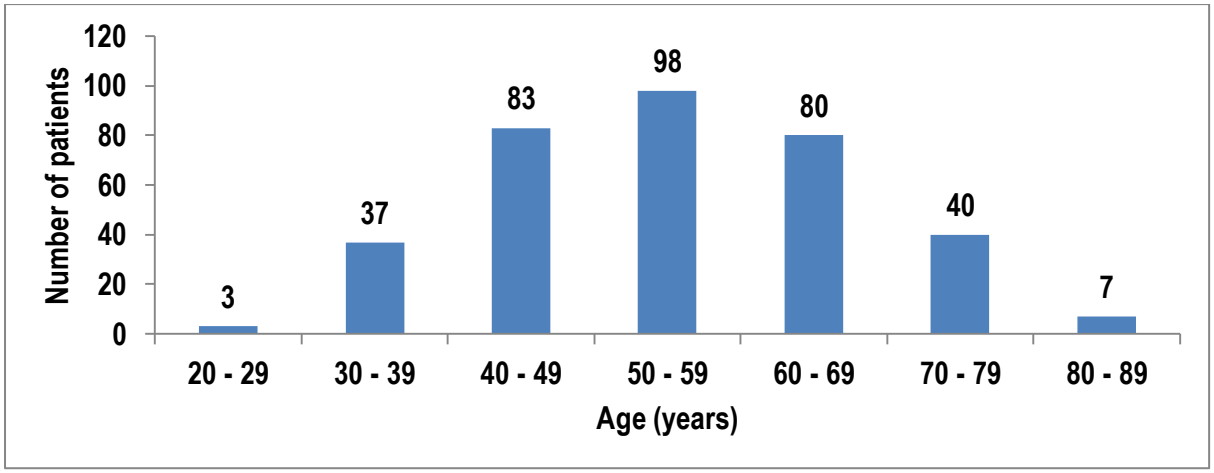
Table 2: Association between tumour grading (TNM classification) and survival at 3 years

TNM stage and survival at 3 years.	p-Value	Odds-Ratio	95% Confidence interval
Tumour (T3 +T4 vs. T1 +T2)	0.002	0.26	0.10-0.63
Node (N1-3 vs. N0)	<0.001	0.25	0.13-0.48
Metastasis (M1 vs. M0)	<0.001	0.13	0.07-0.25

Table 3 Sites of Metastatic Breast Cancer.

Metastases	Number of Cases N (%)
Lungs only	46 (57.5)
Lungs and others	31 (38.8)
Lungs total	77 (96.3)
Not lungs-brain, head	3 (3.7)
Total	80 (100)

Figure 1: Age distribution of the 348 breast cancer patients (2013-2018)



DISCUSSION:

To our knowledge this is the first report of the use of CT staging of patients with breast cancer in the Pacific Islands. The study is limited by lack of adequate information on histology, the presence of tumour markers, details of treatment modalities and in some cases details of tumour staging. Nevertheless the study clearly shows the value of CT as a predictor of prognosis.

The age demographics of our study population showed a mean age at 54.9 years. This is younger than that in the United States (median of 63.0 years in white and 60.0 years in black patients) and older than that reported in India (mean of 50.1 years) and Africa (mean of 50.0 years) [6-8].

The prevalence of breast cancer in males (0.9%) in our study is comparable to that reported from the USA [9].

The 3 years survival rate of 60.0%, in our study compares very poorly with the over 85% age standardised 5 year survival reported from industrialized nations [10]. Breast cancer survival remains lower in Eastern Europe and Africa [11]. The 5-year survival estimates range from less than 20% survival in Mali and the Gambia, to 35–50% in Uganda [12].

In contrast to other studies which reported a higher proportion of cancer's in the left than the right breast there was no difference in the present study and the prevalence of bilateral involvement (2%) was similar to that reported elsewhere [13,14].

Fiji provides a manageable population for data collection and analysis. Almost every citizen is registered either with a birth certificate or voter identification card. Patients have hospital numbers allocated with the capacity for recording their admissions, clinic attendance, pharmacy records, radiology and pathology results, surgical reports, allergy reports, personal profile and discharge/referral summaries. However the quantitative and qualitative data available for this study has highlighted the urgent need for major improvement in documenting important information.

Mammography and ultrasonography are available in Fiji. They are less costly than CT but their diagnostic capability is limited and the role of the different imaging modalities in a country with limited resources remains to be determined.

A disturbing incidental finding of the study was that more than 19% of the diagnosed breast cancer patients did not get any form of treatment simply by not coming back to the hospital. The oncology register recorded them as "did not turn up for clinic" or "refused treatment".

Reasons for this high refusal of treatment may include belief in breast cancer as a "custom" rather than a medical event, ignorance of treatment options, fear of the effects of

treatment or, in a country with a very strong religious background, belief in prayer to heal. This clearly is an area for further research.

CONCLUSION:

The age related incidence of breast cancer in Fiji appears to be lower than in industrialized countries. In the absence of detailed histopathological and molecular diagnosis, CT predicted 3 year survival. Early diagnosis of breast cancer is key to planning appropriate treatment options and CT has an important role to play.

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DAPAGLIFLOZIN REVIEW: MORE THAN AN ANTI-DIABETIC DRUG

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ABSTRACT:
Diabetes Mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. DM is a significant health care concern. Worldwide, the prevalence is increasing at an alarming rate despite using different classes of anti-hyperglycemic agents. Although several treatment options reduce hyperglycemia, only half the patients achieve desirable glycemic targets. Newer treatments that significantly reduce hyperglycemia with novel mechanism of action and acceptable safety profiles are warranted to reduce complications associated with type 2 DM. Sodium-glucose cotransporter-2 inhibitors are anti-hyperglycemic agents with unique mechanism of action that lower blood glucose level independent of insulin. Recent findings on efficacy and safety establish their role in the treatment of DM. Sodium-glucose cotransporter-2 inhibitors may be an option in type 2 DM patients not willing or not ready to start insulin, those requiring additional glucose lowering and in those with acceptable risk factor profiles. Dapagliflozin (Farxiga) can be used at any stage of type 2 DM as a mono-therapy or in combination with other oral hypoglycemic agents and insulin. This review highlights the efficacy and safety of dapagliflozin as an anti-hyperglycemic agent and its use in co-morbid conditions like chronic kidney disease and cardiovascular diseases.

Keywords: Dapagliflozin, Sodium-glucose cotransporter-2 Inhibitors, Insulin, Type 2 Diabetes Mellitus
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INTRODUCTION:

Diabetes Mellitus (DM) is a significant international health care concern that is growing in prevalence [1]. In 2019, approximately 463 million adults (20-79 years) were living with diabetes worldwide; by 2045 this will rise to about 700 million [1]. The proportion of people with type 2 diabetes mellitus (T2DM) is increasing in most countries with 79% adult diabetics living in low- and middle-income countries [1]. In 2019, 1 in 2 or 232 million people with diabetes were undiagnosed and 374 million people were at increased risk of developing T2DM [1]. People with T2DM are at risk of developing complications, including macrovascular

(cardiovascular disease (CVD), strokes, and heart failure (HF)) and microvascular (chronic kidney disease (CKD) and damage to the eyes and nerves) complications [2]. Furthermore, T2DM is a progressive disease characterized by a gradual and continuing loss of pancreatic β-cell function. This results in deterioration in glycemic control and eventually for the need for insulin-replacement therapy. This long-term requirement for the escalation of therapy exerts additional pressure to have access to a wide range of therapies. Optimized glycemic control reduces the risk of diabetic complications. Several glycated hemoglobin (HbA1c) glycemic targets have been proposed for the management of diabetes, ranging from 6.0% to 8.5% (42–69 mmol/L) [3]. Significant improvement in glycemic control is urgently required as it is estimated that only about half of the diabetic population reach the proposed glycemic targets [3].

Current T2DM management guidelines recommend initiating lifestyle modifications and metformin as first-line therapy, but beyond that, anti-hyperglycemic therapy becomes very patient specific [4, 5]. Even when patients are able to achieve a target goal of less than <7% (53 mmol/L) HbA1c, it is difficult to maintain this long term as their disease progresses [6, 7]. Anti-hyperglycemic agents with novel mechanisms and synergistic effects when used in combination with other anti-hyperglycemic agents are necessary to expand the number of treatment options available to patients with T2DM [8]. The aim of this article is to review the literature on dapagliflozin use as monotherapy and in combination with other oral hypoglycemic agents and insulin. This review also highlights the use of dapagliflozin in CKD with or without diabetes, in CKD with and without cardiovascular disease, in heart failure and CKD with or without T2DM and in type 1 diabetes mellitus (T1DM).

Sodium-Glucose Cotransporter-2 (SGLT-2) inhibitor

The SGLT-2 inhibitors are a new class of oral anti-hyperglycemic agents for the treatment of T2DM that improve glycemic control by insulin-independent mechanisms. SGLT-2 inhibitors increase glucosuria by reducing reabsorption of glucose from the proximal tubule of the kidneys. This unique mechanism of action of SGLT-2 inhibitors complements that of other classes of anti-hyperglycemic agents, allowing for their use as combination therapy with other anti-hyperglycemic agents including insulin [9]. SGLT-2 inhibitors also exhibit natriuretic effect by reducing sodium reabsorption, which may partially explain the observed reduction in blood pressure (BP). These reductions in BP are not accompanied by increases in heart rate, indicating a lack of reflex sympathetic nervous system activation [2]. The natriuretic effects of SGLT-2 inhibitors, which may lead to reductions in plasma volume and cardiac preload, also occur without activation of the renin–angiotensin–aldosterone (RAA) system.

This therapeutic class includes agents like canagliflozin, dapagliflozin, empagliflozin, remogliflozin and ertugliflozin [2].

Dapagliflozin:

Dapagliflozin competitively, reversibly, and highly selectively inhibits SGLT2. There are two isoforms of the Sodium-Glucose Co-transporter (SGLT). They are SGLT-1 and SGLT-2. Both are expressed in the kidneys and on the epithelial lining of the proximal convoluted tubules (PCT). SGLT-2 is located in the cells of the S1 and S2 segments of the PCT and has a high capacity but low affinity for glucose transport [10]. Physiologically, in healthy individuals, these transporters are responsible for approximately 90% of renal glucose absorption [10]. Dapagliflozin is a highly potent SGLT-2 inhibitor that is over 1400 times more selective for SGLT-2 than SGLT-1, which is one of the transporters responsible for glucose absorption in the intestine [9].

By blocking SGLT-2, dapagliflozin promotes glucose filtration through the kidneys and into the urine to be eliminated from the body. To quantify the degree of glucose excretion that occurs with dapagliflozin, studies have examined 24 h glucose excretion amounts in healthy subjects as well as in patients with T2DM given a range of dapagliflozin doses [8]. Dapagliflozin doses of 20–100 mg have resulted in urinary glucose excretion of approximately 60 g over 24 h in healthy volunteers. In subjects with T2DM who received dapagliflozin doses between 2.5 and 20 mg, the 24 h glucose excretion after 1 day ranged from 38 to 77 g; after 14 days the range was from 42 to 73 g [8]. In comparison, patients who have a mutation of the SGLT-2 gene *SLC5A2* can excrete up to 125 g per day of glucose with no clinically relevant adverse outcomes [8]. Other studies [11] have demonstrated that the 24 h urine glucose excretion with dapagliflozin represents about 40–50% of the human-filtered glucose load. One of the potential reasons proposed for this ceiling effect was that when SGLT-2 is inhibited, SGLT-1 may compensate by increasing reabsorption of glucose [8].

Dapagliflozin is usually administered with a starting dose of 5 mg orally in the morning, which can be increased to 10 mg orally in the morning based on the response of the patient and the decision of the clinician [8]. Dapagliflozin is 78% bioavailable and rapidly absorbed [8]. Its half-life is 12.9 h, qualifying for once-daily dosing. Dapagliflozin is not known to have any meaningful drug–drug interactions. It is predominantly metabolized by UDP-glucuronosyltransferase enzyme (UGT1A9) and has minor cytochrome 450-mediated metabolism [8]. Dapagliflozin has been evaluated in combination with glimepiride, metformin, pioglitazone, and sitagliptin. It does not affect the metabolism of these anti-hyperglycemic agents nor is its metabolism affected by them, and there are no known pharmacokinetic (PK) alterations [8].

Dapagliflozin can cause decreases in systolic BP *via* its osmotic diuretic effect, therefore patients receiving antihypertensive agents (especially loop diuretics) or those known to experience hypotension should be closely monitored when using dapagliflozin [8].

Pharmacological properties of dapagliflozin

Pharmacodynamic [9] and pharmacokinetic [12] properties of dapagliflozin are summarized below:

Pharmacodynamic properties [9]

- Highly potent, selective and reversible inhibitor of SGLT-2 (K_i=0.55 nM)
- Glucose excretion is observed after the first dose, is continuous over the 24-h dosing interval and is sustained over the course of treatment
- Urinary glucose excretion induced by dapagliflozin is associated with body weight reduction

Pharmacokinetic properties [12]

- Similar pharmacokinetics in type 1 and 2 diabetes
- Dose-linear pharmacokinetics over 0.1–500 mg; pharmacokinetics does not change after repeated daily dosing for 24 weeks
- Mean steady-state volume of distribution is 118 L; ≈91% bound to plasma proteins (protein binding unchanged by renal or hepatic impairment)
- Extensively metabolized in the liver and kidney to form an inactive metabolite (dapagliflozin 3-O-glucuronide)
- Mean steady-state AUC is estimated to be ≈22% higher in females than males
- No clinically relevant differences in systemic exposure among white, black or Asian races
- In patients with severe hepatic impairment, the mean C_{max} and AUC are 40% and 67% higher than matched healthy controls

Clinical Efficacy

Dapagliflozin is indicated as an adjunct to diet and exercise to improve glycemic control in adults with T2DM. It can be employed as a monotherapy, as initial therapy with metformin, or as an add-on to other oral glucose-lowering agents, including metformin, pioglitazone, glimepiride, sitagliptin, and insulin. Dapagliflozin is currently approved to improve glycemic control in adults with T2DM and to reduce the risk of hospitalization for heart failure in patients with T2DM and established cardiovascular disease or multiple cardiovascular risk factors [9]. It is also approved to reduce the risk of cardiovascular mortality and hospitalization for heart failure in adults with heart failure with reduced ejection fraction (HFrEF) with or without T2DM [9].

Mono-therapy

Dapagliflozin has been evaluated as a monotherapy against placebo [13-17] and versus metformin or placebo [18]. In these studies, the mean HbA1c reduction was 0.66–1.45%, and weight reduction was 1.0–2.73 kg compared to placebo at 24 weeks. There was a reduction in fasting glucose and more patients achieved an HbA1c of 7%. Genital and urinary infections were more common (3.7% and 2.3% difference, respectively) compared to placebo [17].

Dual therapy

In dual therapy, dapagliflozin has been studied with metformin [19], glimepiride [20], pioglitazone [21] and sitagliptin [22]. Dapagliflozin when combined with metformin reduced HbA1c by 0.8% following 102 weeks of therapy, compared to 0.5%–0.68% when combined with the other agents [19]. When combined with glipizide, an average 4.4 kg in weight was lost compared to glipizide alone [23-25]. In comparison, weight loss of 1.74 kg with metformin [19] and 1.8 kg with sitagliptin has been reported [22].

Triple therapy

Dapagliflozin has been used in triple combinations with metformin and sitagliptin [22], metformin and saxagliptin [26] and metformin and a sulfonylurea [27]. Triple therapy has shown HbA1c reductions of up to 0.6% and body weight reductions of 2.2 kg. Urinary and genital infections were higher than in control groups.

Newer avenues of Dapagliflozin

Dapagliflozin in patients with CKD with or without T2DM

Dapagliflozin and other SGLT-2 inhibitors were initially developed for patients with T2DM, but the drugs have shown far-reaching benefits in different patient populations, specifically patients with HFrEF with or without T2DM. Based on the results of Dapagliflozin and Prevention of Adverse Outcomes in Chronic Kidney Disease (DAPA-CKD) trial, which was presented at European Society of Cardiology Congress, dapagliflozin is now indicated to reduce the risk of declining kidney function, kidney failure, cardiovascular mortality, and hospitalization for heart failure in adults with CKD [28].

In the DAPA-CKD trial, dapagliflozin added to usual care reduced the primary composite endpoint, one that included renal and cardiovascular events and mortality, by 39% when compared with usual care alone. The trial was unique in that one-third of patients did not have T2DM, and yet these patients derived the same benefit as those with T2DM. This makes dapagliflozin the first SGLT2 inhibitor to be approved for the treatment of CKD regardless of diabetes status.

The DAPA-CKD study concluded that among patients with chronic kidney disease, regardless of the presence or absence of diabetes, the risk of a composite of a sustained

decline in the estimated glomerular filtration rate (GFR) of at least 50%, end-stage kidney disease, or death from renal or cardiovascular causes was significantly lower with dapagliflozin than with placebo [28].

Dapagliflozin in patients with CKD with and without CVD

The combined cardio-renal benefits of SGLT-2 inhibitors in patients with CKD, with and without T2DM, are substantial; whether there is a history of CVD or not. Dapagliflozin reduces risk of kidney failure, death from cardiovascular causes or hospitalization for heart failure and prolonged survival in people with CKD, independently of the presence of concomitant CVD. In a pre-specified secondary analysis from the DAPA-DKD trial, the authors observed that treatment with dapagliflozin reduced the absolute risk of cardiovascular or renal death or a renal event by 6% and 5% over a period of 32 months in patients with and without CVD, respectively [29]. The absolute risk of all-cause death (−3.3% and −1.4%) and a heart failure hospitalization (−3.2% and −0.7%) were also reduced by dapagliflozin compared with placebo in both groups with acceptable safety.

The study compared outcomes in 4304 patients with chronic kidney disease who were randomized to treatment with dapagliflozin or placebo. In a pre-specified subgroup analysis, they examined whether these outcomes were influenced by the presence or absence of CVD. Of the total study population, 37.4% were secondary prevention patients, and these patients were more often male and more likely to have T2DM. Additionally, the secondary prevention group had a higher BMI and higher blood pressures versus other participants [29]. The primary and secondary prevention groups had similar estimated GFR and median urinary albumin-to-creatinine ratio. Rate of kidney failure was similar between the two groups, but the secondary prevention group had higher rates of adverse cardiovascular outcomes. The primary composite outcome (which included a sustained decline in e-GFR of 50% or lower, end-stage kidney disease, and kidney or cardiovascular death) was significantly reduced by dapagliflozin treatment in both the primary and secondary prevention groups. Additionally, dapagliflozin treatment yielded similar reductions in both groups in a composite outcome of heart failure hospitalization and cardiovascular death and in all-cause mortality [29]. No differences in rates of adverse events were detected between the groups.

Based on these data, benefits from dapagliflozin are present in patients with and without CVD. The study adds information to existing knowledge, and it may now be suggested that SGLT-2 inhibitors prevent progression of renal disease and heart failure, and improve survival in a broad clinical spectrum, including patients with T2DM, CKD, and heart failure. The clinical implications of the study are that physicians should be aware of estimated glomerular filtration rate (e-GFR) and

albumin excretion (spot urine) in patients with T2DM, hypertension, atherosclerotic disease, and CKD to initiate SGLT2 inhibition to improve primary and secondary "cardio-renal prevention" [29].

Dapagliflozin in Heart Failure and CKD with or without T2DM

Dapagliflozin slows the rate of decline in e-GFR in patients with heart failure with reduced ejection fraction both in patients with and without T2DM. There is no effect on the efficacy of dapagliflozin by baseline kidney function in preventing the risk of cardiovascular death or worsening heart failure [30].

The authors assessed the safety and efficacy of dapagliflozin in patients with HFrEF, according to baseline kidney function, in the Dapagliflozin and Prevention of Adverse-outcomes in Heart Failure (DAPA-HF) trial [30]. The effect of dapagliflozin on kidney function after randomization was also assessed. HFrEF patients with or without T2DM and an e-GFR over 30 ml/min/1.73m^2 were enrolled in DAPA-HF trial. The incidence of the primary outcome (CV death or worsening HF) according to e-GFR category at baseline (<60 and ≥60 ml/min/1.73m^2) as well as using e-GFR at baseline as a continuous measure were calculated. Secondary cardiovascular outcomes and a pre-specified composite renal outcome (≥ 50% sustained decline e-GFR, end stage renal disease (ESRD) or renal death) were also examined, along with decline in e-GFR over time.

According to the authors [30], of the 4742 patients with baseline e-GFR, 41% had e-GFR over 60 ml/min/1.73m^2. The effect of dapagliflozin on the primary and secondary outcomes did not differ by e-GFR category or examining e-GFR as a continuous measurement. The composite renal outcome was not reduced by dapagliflozin (HR=0.71, 95% CI 0.44, 1.16; p=0.17) but the rate of decline in e-GFR between day 14 and 720 was less with dapagliflozin, -1.09 vs. placebo -2.87 ml/min/1.73m^2 per year (p<0.001) and was observed in those with and without T2DM (p = 0.92).

Dapagliflozin slows the progression of kidney dysfunction, including in patients without T2DM and the benefits on morbidity and mortality in HFrEF were not modified by baseline kidney function [30].

Dapagliflozin in patients with T1DM

Insulin replacement therapy is the mainstay of treatment for patients with T1DM. Despite the improvements over the years in insulin delivery and glucose monitoring systems, glycemic control in patients with T1DM is often suboptimal, with less than a third of this population achieving optimal glycemic control (with HbA1c below 7%) [31]. Although intensive insulin treatment may be used to improve poor glycemic control, its therapeutic potential is limited by the increased risk of hypoglycemia

and weight gain, which are associated with a greater risk of adverse cardiovascular outcomes. Severe hypoglycemic episodes may also lead to events such as seizures, coma or death. Furthermore, glycemic variability (the fluctuations in blood glucose levels throughout the day) is an independent risk factor for hypoglycemia in T1DM. Obesity and insulin resistance are also associated with intensive insulin therapy and have become more prevalent in T1DM [31]. Therefore, improving glycemic control without increasing the risk of hypoglycemia and other related comorbidities is an important objective in the management of T1D [31].

Dapagliflozin, an SGLT2 inhibitor, is the first oral treatment approved in T1DM in the EU where it is indicated as an adjunct to insulin in adults with T1DM and BMI of above 27 kg/m^2, when insulin alone does not provide adequate glycemic control despite optimal insulin therapy [31].

Adverse effects and warnings

Genital Infections

One of the most common adverse effects appear to be genital infections; because high concentrations of glucose in the urine facilitates the onset of mycotic infections [32]. Volume depletion has been reported. This may be due to osmotic diuresis induced by glycosuria resulting from SGLT-2 inhibition. This is usually accompanied by increased urinary frequency, thirst, and rarely orthostatic hypotension [32]. Risk factors for volume depletion include, age over 75 years, GFR below 60 mL/min/1.73m^2, and use of loop diuretics [32].

Ketoacidosis

Pancreatic insulin deficiency from any cause, caloric restriction, and alcohol abuse may predispose patients to developing ketoacidosis. A possible explanation suggests that by lowering serum glucose levels through the inhibition of glucose reabsorption in the kidneys, SGLT2 inhibitors lead to decreased insulin release and increased glucagon secretion in the pancreatic cells. Glucagon stimulates production of ketone bodies via the beta-oxidation of free fatty acids in the liver. Additionally, SGLT-2 inhibitors directly stimulate glucagon release from the pancreas, which results in increased production of the ketone bodies (acetoacetate, beta-hydroxybutyrate and acetone).

Indeed, in normal physiology, glucose stimulation of insulin release by the beta cells, coupled with subsequent insulin-induced inhibition of glucagon secretion, leads to a high insulin-to-glucagon ratio in the pancreatic venous flow and portal circulation, promoting glycogenesis. The renal glucose loss observed with SGLT-2 inhibitors decrease insulin stimulation and insulin-to-glucagon ratio, leading to decreased glycogenesis, and in the setting of prolonged glucose deprivation, increased gluconeogenesis, and glycogenolysis [33]. The lack of circulating glucose results in an increased production of

glucagon and ketoacids. Another possible mechanism of ketoacidosis is an SGLT2 inhibitor-induced starvation state that results in increased renal reabsorption of ketone bodies. Eventually, there will be a buildup of ketosis in the presence of lower glucose levels, which is exacerbated in acute stress or lower carbohydrates availability [33].

SGLT-2 inhibitors and lower limb complications

A meta-analysis by *Lin et al* [34] examined the associations between the use of SGLT-2 inhibitors and the risk of lower limb complications. The analysis concluded that risks of amputation and peripheral arterial disease (PAD) are slightly increased in patients with canagliflozin treatment. Reductions in body weight and blood pressure were associated with lower limb complications in patients with SGLT-2 inhibitor treatment [34].

Summary

Dapagliflozin lowers glucose levels independently of insulin action. Dapagliflozin provides effective glycemic control and reduces bodyweight and blood pressure. It reduces rate of cardiovascular death or hospitalization for heart failure, does not adversely affect major adverse cardiovascular events and reduces progression of renal disease. There is low risk of hypoglycemia with dapagliflozin, while genital infections and DKA are more common than with placebo. Dapagliflozin is also used as an adjunct to insulin in adults with T1DM and a BMI more than 27 kg/m^2 in whom insulin alone does not provide adequate glycemic control. Dapagliflozin is generally well tolerated with manageable safety profile. Also, dapagliflozin is effective in chronic kidney disease with or without diabetes, chronic kidney disease with or without T2DM, independently of the presence of concomitant cardiovascular disease, chronic kidney disease and heart failure with or without T2DM and in T1DM. Further studies are warranted for its pleotropic effects which extend beyond diabetes management.

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SHORT COMMUNICATION:

GERIATRIC MEDICINE CONCEPTS: TRAJECTORY OF ILLNESS, LIFE COURSE APPROACH AND COMPREHENSIVE GERIATRIC ASSESSMENT

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ABSTRACT:
Globally, there is an increase in older people. Clinicians, particularly primary care physicians, will need to equip themselves with knowledge and have a general approach for management of older people. In this paper, the following geriatric principles and concepts are covered: the trajectory of illness and the life course approach, multifactorial diagnoses and attributable risk, and comprehensive geriatric assessment. The illness trajectory concept enables clinicians to recognize where the patient is at, predict their likely prognosis and offer appropriate treatment decisions, balanced between aggressive curative intent and symptomatic management. The life course approach provides a model for planning intervention, which usually needs cooperation with other specialties. It is a worthwhile reminder for clinicians that older people tend to present with atypical symptoms, with multiple contributing factors towards their illness. Comprehensive geriatric assessment enables the clinician to gather sufficient information to complete clinical decision making for older people.

Keywords: Cardiac Failure; Geriatric Assessment; Healthy Ageing; Illness trajectory; Life course
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INTRODUCTION:

There is a global increase in the proportion of older people. In the Western Pacific region, older people are the fastest growing age group due to longer life expectancies and declining fertility rates [1]. The transition from ageing to aged is rapid; there are more than 700 million people aged 65 and older worldwide, of which more than 240 million are in the Western Pacific region. This is expected to double by 2050 [1]. Older patients admitted to hospital also tend to have a high burden of comorbidities, cognitive and functional decline, requiring medical and allied health input for assessment, treatment and rehabilitation [2].

Clinicians, particularly primary care physicians, will need to equip themselves with knowledge

and have a general approach for management of older people. In this paper, the following geriatric principles and concepts are covered: the trajectory of illness and the life course approach, multifactorial diagnoses and attributable risk, and comprehensive geriatric assessment.

Trajectory of illness and life course approach:

The trajectory of illness and a life course approach are useful concepts that can be applied to chronic diseases to formulate a comprehensive management plan and the required integrated care services for patients. The trajectory of chronic illnesses can be broadly categorised into three subgroups: [3]

1. For conditions such as cancer, there is a short period of evident decline in function before the person dies.
2. For heart and lung failure, there is a progressive longer-term decline with intermittent exacerbations of disease.
3. For frailty and dementia, there is usually a prolonged dwindling before a person dies.

The "life course approach" focuses on contributors to illness and health needs over a person's lifetime. Healthy ageing starts at birth based on genetic inheritance; over time, the interaction with positive or negative environmental influences determines their intrinsic capacity and functional ability [4]. Over a life-course, there are multiple opportunities for intervention to promote healthy ageing and function.

For each older patient presenting for clinical review, it is useful to take a step back and decide where the patient is within this trajectory of disease. This helps decide the overall goals and expected management for an older patient, assisting clinicians, patients and family to plan appropriate care between the continuum of active and palliative management.

This can be illustrated further by exploring in more detail a patient with cardiac failure. The typical disease trajectory for cardiac failure is a gradual decline, with episodes of acute deterioration requiring hospitalisation and some recovery, finally resulting in a more sudden, seemingly unexpected death.

Figure 1 shows a hypothetical survival-time graph with specific critical points as follows:

[A]: For a healthy individual without illness, a prolonged survival rate is expected but this likelihood will gradually decrease with age and over time.

[B]: A catastrophic event may occur unpredictably leading to an immediate demise of a person (Example: sudden cardiac death in Brugada syndrome or Ventricular Arrhythmia).

[C]: An acute illness, such as myocardial infarction occurs, with associated increased risk of mortality.

[D]: With treatment, such as percutaneous coronary interventions and medications, the survival rate improves but does not return to pre-illness stage.

[E]: However, without treatment, there is a steep decline in likelihood of survival.

[F]: Despite optimal treatment, the initial insult [C] leads to a downward trajectory, gradually leading to onset of organ failure (cardiac failure).

[G]: Other concurrent illnesses (for example, chronic obstructive pulmonary disease, chronic renal impairment) will cause a cumulative effect to the decline in survival and function.

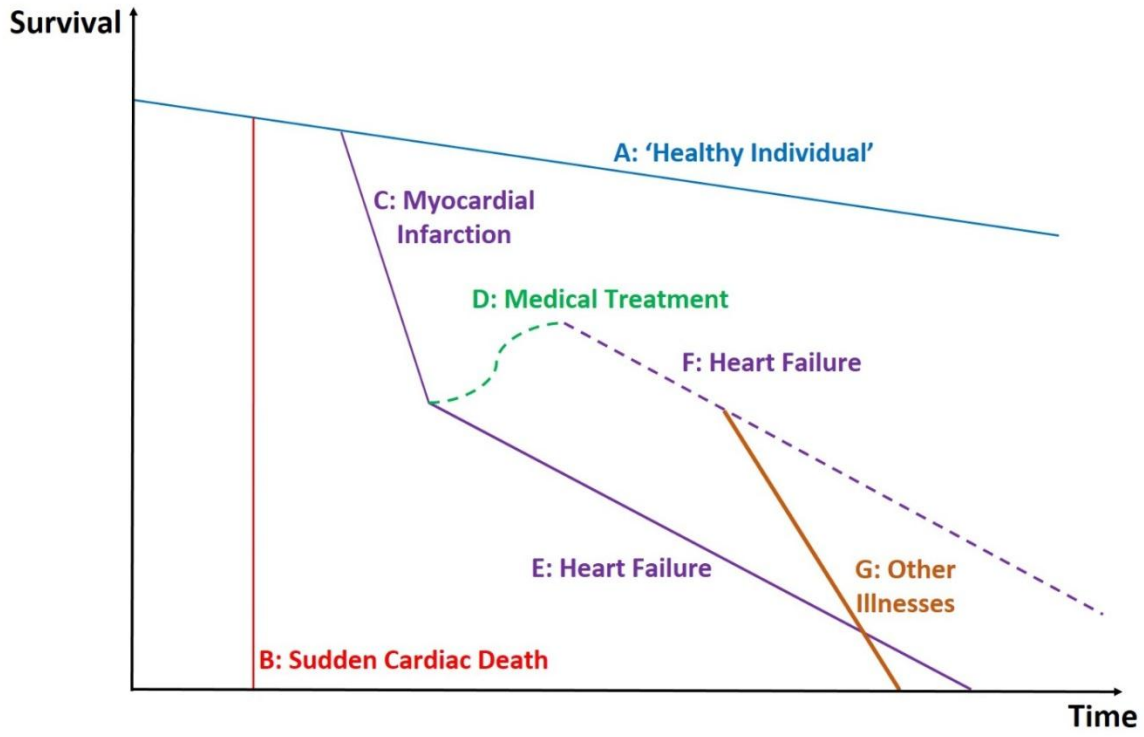

Figure 1: Survival-Time graph illustrating the life course and trajectory of illness

The vertical axis (survival) may also represent individual or organ function. For example, in cardiac failure, function may represent a person's exertional tolerance or ejection fraction on echocardiography. It is important to note that rather than an obvious downhill 'slippery slope', the trajectory will be punctuated by exacerbations and recovery after symptomatic treatment of cardiac failure.

Once the concept of illness trajectory is recognised, several strategies can be put in place to reduce the burden of chronic disease in a population. For example, in the case of preventing cardiac failure, these considerations should start as early as antenatal care, such as folic acid supplementation and ameliorating risk factors such as maternal rubella to prevent congenital cardiovascular defects [5].

These strategies include:

[A]: Public health measures should be in place to optimise organ development, such as nutrition, physical activity and effective health education.

[B] and [C]: Primary prevention, early diagnosis of risk factors, and delay in disease onset improves survival from chronic disease. This relies on effective health education and primary care.

[D]: After disease onset, early and effective treatment to salvage function is important. This requires ongoing improvement and accessibility of medical services, availability of treatment modalities and medications, as well as research for ongoing advancement in treatment.

[E], [F] and [G]: Secondary prevention measures and ongoing follow-up to optimise cardiac failure is required. Patient self-management is essential to slow any further decline in function. The patients should be advised to seek medical attention early if there is any further deterioration so assessment can be initiated to rule out other medical problems.

Awareness of where a patient is within this trajectory is useful for advance care planning, so that appropriate treatment can be instituted, with an emphasis on function. A downward spiral in function should be identified when frequent exacerbations occur so that palliative care can be introduced early to maintain quality of life [6].

When clinicians utilise this approach to recognise the trajectory of disease, longitudinal data on prognosis of patients with cardiac failure found that the majority of patients had a predictable and gradual progression towards death [7].

In short, it is important for clinicians to understand the illness trajectory concept so that they can recognize where the patient is at, predict their likely prognosis and offer appropriate treatment decisions, balanced between aggressive curative intent and symptomatic management. The life course approach provides a model for planning intervention, which needs cooperation with other specialties such as primary care, public health, geriatrics and palliative care outside subspecialty care, which in this case is cardiology [8].

Multifactorial Diagnoses and Attributable Risk:

Older people tend to present with atypical symptoms, while the underlying diagnoses causing their cognitive and functional decline are usually multifactorial. An older patient presenting with acute confusion usually does not present with primary brain pathology. The patient presenting with delirium may actually have a urinary tract infection contributed by benign prostatic hypertrophy and a background of undiagnosed dementia with multiple vascular risk factors.

The concept of attributable risk divides each contributor or risk factor to cause the likelihood of the disease. For example, an older patient

with atrial fibrillation and uncontrolled hypertension may develop a stroke contributed mainly by these two risk factors. The CHA_2DS_2-VASc scoring system assesses the risk of embolic stroke for patients with atrial fibrillation and determines if a patient will benefit from anticoagulation [9]. It is essentially a mnemonic which stands for the following: congestive cardiac failure, hypertension, age 75 or over (Scoring 2), diabetes, previous stroke or transient ischaemic attack (Scoring 2), vascular disease, age 65 to 74 years and female gender. The risk of stroke increases significantly for old age and female gender, which are non-modifiable risk factors. Each of the remaining risk factors should therefore be managed to reduce the risk of stroke as much as possible. A study found that clinicians tended to focus on anticoagulation rather than the other risk factors with a 75% compliance rate for anticoagulation, while two-thirds of the patients did not have their hypertension well-controlled [10]. The challenge for clinicians is to identify and manage as many attributable risk factors as possible in older people to significantly alter the trajectory of decline for the patient.

Falls are another reason for older people to present to hospital, which has multiple attributable risk factors. For example, if an older person fell after tripping over a rug, removal of the rug alone may not be enough to reduce their future risk of falls if other risk factors such as lower limb weakness contributed by a poor nutritional status or visual impairment remained unaddressed. Fall risk assessment tools have been developed to identify fall risk (even prior to an actual fall) for older people presenting to hospital [11]. Applying the life-course approach, community and public health interventions should also be planned from the start to reduce the risk of falls in older people [12].

Comprehensive Geriatric Assessment:

Comprehensive geriatric assessment is an approach that should be applied for older people with complex medical conditions. This multidimensional approach reviews the medical, psychosocial and functional aspects of a patient with an emphasis on functional status and quality of life [13].

There are multiple areas for assessment including their symptoms and illness, medications, family situation and available support, environment and whether it is conducive for function, cognition, mobility, balance, nutritional status and rehabilitation potential [14]. Clinicians also should assess the reliability and objectivity of history, which may need corroboration through collateral history taking. To reiterate previous points, this long “checklist” is necessary because older people tend to present with non-specific symptoms and multi-system disorders. They may also interpret these issues as normal for age. The clinician may find it challenging to decide which issues to prioritise. Communication barriers, such as cognitive dysfunction, vision and hearing impairments or

depression may also complicate the assessment process. Essentially, everything is interrelated, and pathology in one organ may indicate pathology in another (for example, delirium).

This can be seen in an older person presenting with weight loss. This could be due to medical conditions, such as cardiac failure, cancer, dementia or even constipation. However, more commonly, this is contributed by limited dentition or poorly fitting dentures. Their appetite may be affected by loneliness, depression or drugs. This could also be due to social circumstances such as lack of financial resources or disabilities which are non-compensated, causing limited access to getting food or preparing meals.

Functional assessment is important, as autonomy and independence are a priority for older people. A systematic enquiry is required for activities of daily living (bathing, dressing, toileting, transferring, continence, feeding) and instrumental activities of daily living (shopping, preparing meals, cleaning the house, laundry, driving or using public transport, taking medications, managing finances). If these functions are unable to be performed, clinicians should consider rehabilitation of these patients if they have potential, and consider adaptive approaches or availability of social support. Assessment and discharge planning is usually through coordination of a multidisciplinary team, which includes a physiotherapist, occupational therapist, social worker, dietitian and speech language therapists, depending on the indication.

Overall, comprehensive geriatric assessment gathers sufficient information to allow the clinician to complete clinical decision making for older people. Formulating a management plan should then take into account, the strength of supportive scientific evidence, tolerability of treatment, remaining life expectancy (applying the concept of the trajectory of illness) and patient preferences [15].

CONCLUSION:

Given the increase in the number of older people, clinicians should become more familiar with assessment and management of geriatric conditions. It is hoped that these concepts; the trajectory of illness and life-course approach, multifactorial diagnoses and attributable risk, as well as comprehensive geriatric assessment assist clinicians in this role to maintain the health and well-being of older people.

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INEQUITIES AND INEQUALITIES IN HEALTH AND SOME PUBLIC HEALTH PROPOSALS THAT MAY IMPROVE INEQUITIES AND INEQUALITIES IN ACCESSING PRIMARY HEALTHCARE SERVICES IN PAPUA NEW GUINEA

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ABSTRACT:
Inequity and inequality in accessing primary healthcare services can be created by systemic and structural barriers in a health system. A recent review of Papua New Guinea's (PNG) health system revealed that there are inequities and inequalities in primary healthcare service access. This disparity is magnified in the rural and remote regions of the country. One of the main reasons for this has been the chronic shortage in government funding. This paper presents an overview of inequities and inequalities in health and suggests some public health approaches that may improve primary healthcare service access in PNG.

Keywords: inequities in health, inequalities in health, primary healthcare service in Papua New Guinea.

INTRODUCTION:

Social determinants of health have been described as the causes of causes [1]. Some examples of these determinants include place of residence, education, income and housing [2]. How much impact these factors have on health are shaped and influenced by systemic and structural barriers and complex dominating social interactions resulting in the health burden being highest amongst those who are lower in the social hierarchy. This has been described as social inequities and inequalities in health [2]. Reducing social inequities and inequalities in health is now a key focus of public health [3].

Health inequity can be defined as 'differences in health that are unnecessary, avoidable, unfair and unjust' [4,p.254]. Inequality in health and inequity in health are not the same [4].

Equity is based on the principle of social justice whereas equality is based on the concept that everyone has to be treated equally [3]. To improve health inequity, the distribution of healthcare services has to be based on the level of healthcare service need. Although improving inequity in health may be viewed as unequal treatment, improving health inequity ensures that those most in need have access to adequate healthcare services [4].

Access to primary healthcare services in Papua New Guinea (PNG) is a significant determinant of health. Grundy et al. [5] reviewed PNG's health system that showed distribution and allocation of resources to primary healthcare services in PNG do not support the health needs of the population leading to inequity and inequality in healthcare service access. Inequity and inequality in healthcare service access is determined by enabling and need factors and other socio-cultural factors at the individual and community level [6,7]. This paper will attempt to highlight some factors that create inequity and inequality in health. Some public health approaches that may help improve inequity and inequality in accessing primary healthcare service in PNG will also be made.

Equity, equality and how they affect access to primary healthcare services

Equality can be defined as two or more things that are same or have similar value [8]. When two or more individuals or two or more groups of individuals are treated equally they have the same things or same things of similar value. Equity on the other hand is based on the principle of social justice [9]. That is, everyone must be given what they need to be successful. Equity in health means that those who need healthcare the most must be given the most resources for good health. When this does not happen in a healthcare system, inequity in health is produced. Equality assumes everyone started out the same or every health program has the same needs but that is not true [8]. Principle of equity ensures that a healthcare system is adequately resourced in a way that ensures everyone benefit based on their respective needs. Equality therefore is not the same as equity [4,9] but both are important concepts in healthcare planning. However, it is important that equity is the driving factor in healthcare service planning and budgeting rather than equality because improving equity ensures healthcare services are distributed and provided according to the level of healthcare need rather than using equality which assumes that everyone has the same healthcare needs.

The concept of equity can be further described as vertical equity and horizontal equity [8]. Principle of vertical equity in health states that people or groups of people with differing healthcare needs should be treated differently based on their health needs [8]. Whereas horizontal equity principle states that equal

treatment should be given to people or groups of people with same or similar health needs [8]. The question then arises, what is the best way to deliver healthcare services factoring in principle of equity in healthcare? Horizontal equity or vertical equity? There is no right or wrong approach. As healthcare managers, our priority setting decisions regarding allocation of resources and or redesigning services should not only consider moral (e.g. equality, equity) and non-moral factors (e.g. genetics, disease epidemiology) but the decisions should be based on consensus, consistency [8] and local context to achieve equity in health.

Inequity and inequality in society affect health. A primary healthcare service delivery structure that delivers same kind of services for all without considering socio-cultural and economic structures that influence health may result in disproportionately affecting the health of those with the greatest healthcare needs [10]. Inequity in accessing and utilising healthcare services can be a reflection of social inequities. A very good example to illustrate the influence of inequities and inequalities in society determining health is tuberculosis treatment outcome [11]. Diefanbach-Elstob et al. [11] interviewed patients taking treatment for tuberculosis in Balimo in the Western Province of PNG and found that inequity and inequality at the individual, health system, socio-cultural and socio-economic levels determined the treatment outcome. The study revealed that less educated patients, patients with low income levels and patients that did not received family or community support had poor TB outcomes [11]. Inequity and inequality in society can create structural and systemic barriers (socio-cultural or socio-economic) that prevent access and utilisation of primary healthcare services.

Public health approaches to improve inequity and inequality in accessing primary healthcare services in Papua New Guinea

The PNG health system is currently undergoing a restructure transiting to the Provincial Health Authority System (PHA). A review of the PNG health system in 2019 revealed 'significant inequities in access to primary healthcare service' [5,p.xvi]. The greatest impact of these inequities and inequalities has been felt in the rural and remote parts of the country [5]. It is hoped that the PHA system will remove systemic and structural barriers to improve access to primary healthcare service by increasing distribution and supply of primary healthcare services.

Inadequate government funding is a major contributor to the decline in primary healthcare services in PNG [5]. Church health services provide nearly 50% of rural health services in PNG but they too have been inadequately funded and resourced by successive governments [12]. This has led to the

introduction of user-pay policies by some health service providers preventing the poorer segments of the population to access and utilise primary healthcare services [13]. Legislative and policy barriers need to be removed to improve primary healthcare service accesses. Specific action should focus on sustained financial support, essential medicines, appropriate technology and human resources to strengthen the PHA system. Primary healthcare service delivery structures and mechanisms may need to be reviewed to remove any structural and systemic barriers that produce inequity and inequality in accessing primary healthcare services.

Several public health approaches have been proposed to improve inequities and inequalities health [14,15]. These approaches can be tailored to PNG context and applied. Improving inequity and inequality should start with developing a framework for measuring the extent and magnitude of the access inequity and inequality [15]. The WHO also has a framework that countries can use [16]. These tools can help identify barriers that need amending or revisions (e.g. legislations, policies, service delivery mechanisms, health program restructuring). Further, the strategies should involve all sectors of government, private industries, development partners and non-government agencies. The overarching principle should be to remove barriers, re-distribute or increase distribution and supply of primary healthcare services. A key challenge will be how to effectively operationalise any initiative and continued advocacy would be needed for sustainability. Other important factors to consider would be to identify things the health sector can do, tasks other sectors can do and what actions can be done by all sectors [14].

CONCLUSION:

Inequity and inequality in access to primary healthcare service affects health. This essay has presented an overview of inequity and inequality in health and has proposed some public health approaches that can improve access inequity and inequality in primary healthcare services.

Ensuring equality alone is inadequate to improve health. Improving health equity must be a key element in the planning of primary healthcare services and must be supported by adequate resources based on need. Unfortunately, in PNG inadequate government support particularly chronic funding shortage has resulted in inequities and inequalities in access to primary healthcare services. There is a need to review and revise PNG's existing policies and legislations to improve inequities and equalities in primary healthcare service access. It is hoped that the new PHA health service structure will ensure adequate distribution and supply of primary healthcare services in rural and remote parts of PNG.

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LETTER TO THE EDITOR:

AUDIT OF QUALITY OF DOCUMENTATION OF MEDICATION RECONCILIATION AT DISCHARGE FROM HOSPITAL

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Medication reconciliation aims to reduce prescribing errors by ensuring the accuracy of prescribed drugs, particularly undocumented intentional or unintentional discrepancies [1]. According to Wilkin et al [2], an audit of electronic discharge summaries from a regional hospital found that 68% had at least one medication discrepancy, with almost half related to medication omissions. Of these, a third had moderate potential clinical significance, while half had minor clinical significance [2]. We performed an audit of discharge summaries of patients discharged from Geriatric Medicine in Raja Isteri Pengiran Anak Saleha (RIPAS) Hospital, Brunei in June 2020 to assess the quality of documentation of medication reconciliation at discharge.

All patient discharge summaries were available through the national medical electronic records system (Bru-HIMS). The quality of medication reconciliation at discharge was assessed using the standards set out by the Specialist Pharmacy Service of the National Health Service (NHS) in the United Kingdom [3]. The best practice toolkit specifies the following standards for the discharge summary: patient demographics including address and details of their General Practitioner, reason for admission and allergies should be documented. Medication details should include units, frequency, route and formulation, indication and duration for treatment, and follow-up medication review required. Medication reconciliation should also be performed on discharge, explicitly stating medication changes with the clinical reason for prescribing; and if drug monitoring is required. Permission was obtained from the head of Geriatric Medicine to access the clinical notes for the purposes of conducting the audit.

There were 30 patients discharged from Geriatric Medicine in RIPAS Hospital in June

2020, with 233 medications prescribed. All discharge summaries contained patient details, including their full name, date of birth and two patient identifiers. However, the patient's address and details of their General Practitioner were not automatically generated in the discharge summaries. The reason for admission was documented for all patients. While all four patients with drug allergies had these documented, the remaining 26 (87%) did not mention that the patients had no known drug allergies.

In terms of medications, 192 (82.4%) had their generic name with dosing details in correct units, frequency, route and formulation. Only 3 (1.3%) had the indication for their use explicitly specified, while 189 (81.1%) had clear documentation on the duration of prescription and when medication review was required. Pharmacy-led medication reconciliation was documented for 5 (16.7%) of the 30 patients on admission. While our hospital policy mandates pharmacist review of all prescriptions on discharge, including medication reconciliation, there was no indication on the discharge summaries that this occurred. None of the dose changes or discontinued medications were highlighted on the discharge summaries. Only one (3.2%) of newly commenced medications during admission was clearly indicated with a clinical reason for the prescription. One (3.3%) patient required therapeutic drug monitoring (for warfarin), which had clear instructions documented on the discharge summary.

There were several aspects identified which required improvement. Firstly, the patient address and their General Practitioner were not available on the discharge summaries; as well as a statement specifying allergy status for those without drug allergies. There is a pre-set template for electronic discharge summaries in our hospital; this should be updated so that these necessary details to meet the quality indicators are automatically generated in the discharge summaries. Indications for medications, modifications such as dose changes, starting or stopping medications, and the need for drug monitoring were poorly documented. Junior doctors are currently provided formal training on discharge summary documentation, emphasising the importance of accurate discharge medications. It is important to ensure a shared responsibility among clinicians (doctors, nurses and pharmacists) to avoid discrepancies in medications prescribed for patients [4].

Pharmacy-led medication reconciliation on admission was also identified as an area for improvement. Since the audit, the pharmacy department has allocated a designated pharmacist to each medical ward for medication reconciliation. Finally, this audit should be repeated to evaluate the effectiveness of these interventions on

improving the quality of medication reconciliation on discharge.

Conflicts of Interest:

The authors have no conflicts of interests to declare.

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