UNIVERSITY OF NAIROBI, COLLEGE OF HEALTH SCIENCES

DEPARTMENT OF CLINICAL MEDICINE AND THERAPEUTICS.

UON INTERNAL MEDICINE RESIDENTS' KNOWLEDGE, PRACTICES, AND BARRIERS IN CONTRACEPTION PROVISION AMONG WOMEN ON POTENTIALLY TERATOGENIC MEDICATIONS.

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DECLARATION

I Dr Fredrick Mumo Mwaka declare that this is my original work and that to the best of my knowledge, it has not been presented for the award of a degree in any other University. I have run it through the University of Nairobi anti-plagiarism software.

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DEDICATION

This dissertation is dedicated to my family: my daughter Nissa, my Wife Joy, my loving dad, and my sisters Mary and Zipporah. I am indebted to them for extending their love and support while doing this work.

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LIST OF ABBREVIATIONS

ADRs-Adverse Drug Reactions.

AEDS- Anti-Epileptic Drugs.

APLs-Antiphospholipid Antibodies.

COC-Combined oral contraceptives.

CYC-Cyclophosphamide.

ECPs-Emergency contraceptives.

EULAR-European League Against Rheumatism.

FDA-Food and Drug Administration Agency.

FP-Family planning.

FR-Failure Rate.

IUD-Intrauterine Devices.

KNH-Kenyatta National Hospital.

LAM-Lactational amenorrhea method.

LARCS-Long-Acting Reversible Contraceptives.

LEF-Leflunomide.

MMF-Mycophenolate

MOH-Ministry of health.

MTX-Methotrexate

PLLR-Pregnancy and lactation labelling final rule.

Pv-ERs-Pharmacovigilance Electronic Reporting System.

RA-Rheumatoid Arthritis.

SLE-Systemic Lupus Erythematosus.

SPQMPs -Suspected Poor Quality Medical Products.

VTEs-Venous Thromboembolism.

OPERATIONALIZATION OF TERMS

Teratogen- A substance or agent causing developmental malformation in a fetus.

Contraception provision – This entails aspects of contraceptive counselling, referring for contraceptive services, and prescription of contraceptives.

Internal Medicine Resident - a postgraduate student pursuing a Master of Medicine in Internal Medicine.

ABSTRACT

STUDY BACKGROUND

Potentially teratogenic drugs are mainly given to women of reproductive age. In some instances, these women don't get prioritized for contraception despite the harm these drugs may pose to their unborn fetuses. Notably, almost 10% of birth defects arise due to exposure to a potential teratogen. Even though occurrence the of a birth defect is often multifactorial, its residents must do their best in ensuring women of reproductive age get highly effective contraception while on potentially teratogenic drugs. It is important to determine the internal medicine residents' knowledge, practices, and limitations to contraception provision as they cater to a large number of these women.

Objectives

The study objective was to document the internal medicine residents' knowledge of potentially teratogenic medications, Practices and limitations to contraception provision for women of reproductive age taking possibly teratogenic medications.

Study design and setting

A cross-sectional study design, of internal medicine residents and attached to KNH.

METHODS

Residents from the department of internal medicine at the University of Nairobi completed a self-administered questionnaire after informed consent.

RESULTS

Residents overestimated the effectiveness of barrier techniques despite being aware of the high effectiveness of the intrauterine device. Nearly all identified methotrexate 90.8% as a teratogen and 86.8% identified cyclophosphamide. Leflunomide (36.8%) ranked higher than mycophenolate (21.1%) which was an overestimation since leflunomide isn't a potential teratogen. The study recorded a response rate of 80% with most respondents (96%) having cared for reproductive-aged women taking potentially teratogenic medications in the previous year. The mean percentage of drugs in the category that was appropriately identified as potentially teratogenic was 34.4%. Residents were less likely to correctly identify low-risk teratogenic medication than potentially teratogenic medications. The mean percent correct for knowledge of published contraceptive failure rates was 39.0%. The majority of respondents (73.3 %%) said that primary care doctors should be able to prescribe contraceptives. A total of 81.6% of physicians said it was somewhat or very difficult to communicate with other doctors treating the same patient, and more than half believed their training in medical school or residency (57.9%) had not adequately prepared them to recommend or prescribe contraceptives.

Conclusion.

Residents normally come across reproductive-age women using potentially teratogenic medications but lack sufficient knowledge about probable teratogens and contraceptive failure rates to avert fetal drug exposure. Uncertainty around the use of these drugs in pregnancy may lead to the withdrawal of treatment from women unnecessarily.

Time constraints was identified as the major limiting factor in the provision of counselling and booking sufficient patient numbers would be able to solve this limitation. Mitigation of other identified limitations like a miscommunication between clinicians would be a good step towards improving care in women taking potentially teratogenic medications.

To improve women's care of reproductive age taking potentially teratogenic medications, residents would benefit from improved knowledge about contraceptive effectiveness, teratogens, and guidance on the right practices in enhancing contraception provision. The training needs for residents should entrench contraception provision as a pillar in patient care due to the large number of women on potential teratogenic medications they encounter.

1.0. INTRODUCTION

Medications with potential teratogenicity are frequently prescribed to women of reproductive age each year. Multiple scientific data sources suggest low suitable use of contraception in this population and this may predispose them to unintended pregnancies which may result in birth defects. There is no data in Africa to show the extent of the provision of contraception in women between the ages of 15-49 taking medication with potential teratogenicity. Contraception provision and discussion is a critical element in the care of women taking potentially teratogenic drugs. Contraception choice has to be tailored individually.

The unintended pregnancy burden in Kenya is high. A study done by Performance Monitoring for Action in 2019 showed unplanned pregnancies had increased to 44%[1]. Unintended pregnancies may hamper intentions to withdraw potentially teratogenic drugs before conception [2]. The Food and Drug Administration Agency(FDA) has categorized drugs with potential teratogenicity as categories D and X [3] but despite this categorization, there are no risk assessment guidelines in Kenya. In our country drugs are prescribed by clinicians and dispensed by pharmacists who ideally ought to countercheck drugs for fetal toxicity before dispensing them to at-risk women. A study done in Ethiopia showed that even professional pharmacists had inadequate knowledge of commonly prescribed drugs [4].

The setting of pregnancy brings unique challenges in managing some diseases and therefore the choice of contraception should be highly effective. Some contraceptives especially oral contraceptives are a risk factor for the development of vascular thromboembolic events (VTEs) and therefore should be avoided in patients with existing risk for VTEs. In other special cases like patients with thrombocytopenia, contraceptives with side effects of menorrhagia should be avoided [5].

Recently, a study on a group of women with Systemic lupus erythematosus with an identified risk of unplanned pregnancy established that 59% had no counselling on contraception in the preceding year while 53% used the less effective barrier methods [6]. This was inclusive of many who were on potentially teratogenic drugs. Birth control methods were reliant on established high rates of failure. Long-acting contraceptives for example intrauterine devices (IUDs) are the recommended method but were rarely used.

Contraception provision entails judicious and highly effective referral, counselling and prescription of contraceptives. Physicians are a key pillar to ensure proper planning of pregnancy in patients with rheumatic diseases. According to American data, physicians have decreased awareness of these teratogenic medications[7]. Notably, for one in every thirteen hospital visits, women of their reproductive age received a prescription for a potentially teratogenic drug. Physicians provided care to 45% of women who had these prescriptions. In more than 80% of these visits involving potentially teratogenic prescriptions, counselling on appropriate contraceptives was not offered. Physician knowledge examined in America showed physicians rarely provided contraception, referral, counselling and prescription for contraception, to their patients despite prescribing potentially teratogenic drugs to them[7]. Another study done on rheumatologists showed inadequate knowledge of potential teratogenic anti-rheumatic medications they prescribe to their patients. In the same study rheumatologists rarely referred their patients to gynecologists for contraception care.

There are multiple barriers to the provision of contraception in women taking teratogenic drugs. The most advanced barriers included inadequate time and the lack of adequate knowledge by physicians on contraception [8]. The other barriers identified included a poor billing and reimbursement framework for time spent counselling and uncertainty about their role as concerns contraception. Potential interventions for improving the provision of contraception for women of reproductive age have been previously studied. Some interventions include risk mitigation programs[9] and the presence of a pocket booklet/mobile application to consult for the physicians who felt knowledge was the challenge.

The Donabedian model provides a substructure for in-depth evaluation of the quality of health care services. In this model quality of care, information is in three categories namely process, structure and outcomes. Process describes the interaction between healthcare providers and their clients. The structure is the context within which healthcare is delivered ranging from physical buildings to human resources and financing. Lastly, outcomes are the effects on the health status of patients.

The Donabedian concept was thus chosen for the assessment of internal medicine residents' knowledge of potentially teratogenic drugs among women. This will help in gauging the quality of reproductive health care provided by internal medicine residents to women of reproductive age.

1.1. LITERATURE REVIEW

Women of childbearing age frequently receive prescriptions with potentially teratogenic medication. Some of these drugs can cross the placenta thus causing fetal exposure to these potentially harmful substances. Exposure to potentially teratogenic drugs in utero increases the risks for congenital malformations[10]. While taking potentially teratogenic medications women are not routinely provided with contraception or educated about the importance of contraceptive use. Most medication used in the management of rheumatic diseases has possible teratogenicity and it's, therefore, necessary to use an effective contraceptive method to prevent fetal exposure to such medications[11].

In their childbearing years, women with rheumatic diseases face multiple reproductive health challenges. Women with rheumatic disorders such as systemic lupus erythematosus (SLE), Sjogren's syndrome, inflammatory arthritis, inflammatory myopathies, and vasculitides have higher rates of pregnancy-related mortality and morbidity than healthy women. [12]

In the USA, approximately 5.8% of all pregnancies are exposed to potentially teratogenic medication (category D or X drugs).In rheumatology patients, the specific rate is unknown [13]. According to current statistics about 50% of all pregnancies in America are unplanned. Unfortunately, women with rheumatoid arthritis and systemic lupus erythematosus have been reported to be less likely to take contraception than healthy patients [14]. In addition, patients with rheumatic disease contraception are on methods such as natural family planning or barrier methods which have a high failure rate.[15] These ineffective birth control methods place them at higher risk for both pregnancy loss and offspring with congenital malformation. In the management of women with rheumatic diseases birth control discussions are vital. This is because active disease predisposes one to poor outcomes in pregnancy. Furthermore, drugs used in the conditions have possible teratogenicity when used at conception or in the course of pregnancy.[16]

1.1.0. Teratogens

These are agents that may cause both physical and functional defects in the developing human embryo or fetus upon exposure. A teratogenic agent's degree of damage to the embryo or fetus is determined by the embryological stage of development, the total period of exposure and the dose of the substance. Effects of teratogens on the embryo include, physical deformities, behavioral and

emotional stunting and reduced intelligence quotient (IQ). Preterm labour, spontaneous abortions, or miscarriages have been associated with teratogens[17].

1.1.1. Effect of Teratogens on Fetus and Pregnancy

Teratogens affect the fetus in multiple ways. The most noted effects are usually congenital malformations[18] but exposure to these teratogens can cause behavioral and intellectual disability.

Organogenesis is the most precarious stage in the development of the embryo. Exposure within this period, which lasts up to three months from conception will cause structural defects while exposures beyond this period will cause growth defects [19]. Teratogenicity can occur in any trimester of fetal development. The potential for developing birth defects when on potential teratogenic medication depends on:[20]

(i) Specificity of Agent: The impact of teratogen varies with some such as alcohol and smoking having a profound effect. The effects of certain teratogens are organ specific however introduction of the same teratogens at different times during organ differentiation may cause varying effects e.g., administration of thalidomide on the 35th to 37th day would cause ear malformations; however, the same agent between days 41 and 44 causes Amelia or Phocomelia. For certain systems e.g., neural tube defects the injury would need to be before the closing of the neural tube, that is between the third and fourth week but susceptibility in some organs is throughout pregnancy.

(ii) Dose of exposure: The degree of harm to an embryo is directly proportional to the amount of teratogen it's exposed to. There are exceptions to this though. The response of an embryo to a teratogen varies. There may be no effect at a low dose, an intermediate dose may result in organ-specific malformation while a higher dose might cause the death of the embryo.[21] A drug like fluconazole will have less teratogenic effect when taken as a single dose but will have a potential teratogenic effect if taken at higher doses and for a prolonged period [24].

(iii) Duration of exposure: Prolonged exposure causes worse effects.

(iv) Time of exposure: Susceptibility to a teratogen is more pronounced during organogenesis [22].

(v) Genetics: Genetics of the pregnant lady or the embryo may confer protection or increase vulnerability to a teratogen.

1.1.2. Classification of Teratogens

Teratogens are classified into several categories as follows:

Table 1.0 Classification of Teratogens. [23]

TERATOGENS
1. Chemicals and environmental exposures- Toxic metals e.g., mercury and lead. chemicals e.g., Polychlorinated and polybrominated biphenyls
2. Drugs-some prescription drugs such as anticoagulants, antimicrobials, vitamin A in large doses, hormonal medications and antiepileptic drugs (AEDs).
3. Ionizing Radiation- These include; gamma rays, X-rays and sunlight.
4. **Maternal infections-** for example, toxoplasmosis, rubella, syphilis, herpes simplex virus and cytomegalovirus

Women need awareness of these exposures if on potentially teratogenic drugs so that such drugs can be stopped or they can be placed on an effective contraceptive method[24].

1.1. Drugs with Potential Teratogenicity

Safety and regulation of drug use became very rigorous after the thalidomide tragedy[25]. A drug that was actively marketed as safe in pregnancy resulted in fetal deformities like phocomelia and this led to improvement in drug monitoring systems in America (USA). In Africa and Kenya in particular, safety and monitoring systems are weak. There are no guidelines on the use of potentially teratogenic drugs in the country. Similarly, the Pharmacy and Poison's Board website is deficient in the same. Physicians must have a robust knowledge of potentially teratogenic drugs and be able to offer effective contraceptives to women of reproductive age.

Drug use and prescription in pregnancy require specific consideration. However, it is unfortunate that most severe adverse effects of drugs occur early in the first trimester before pregnancy is confirmed due to the extent of unplanned pregnancies worldwide.

Several limitations arise because scientific studies and evidence proving teratogenicity is low. This is further complicated by fifty percent of pregnancies being unplanned and the medical training on pregnancy risk including contraceptive provision being inadequate among physicians [11].

Drug-associated malformations prevalence is low and avoidable. Drug prescription during pregnancy is high and this calls for accurate and up-to-date information on the teratogenic potential of drugs. The FDA classifies drugs according to teratogenic risk in five groups (A, B, C, D, X). Other countries like Germany, Sweden and Australia have developed similar classifications.[26]

Physicians prescribe drugs with potential teratogenicity to a majority of women of reproductive age[7]. To classify these drugs, the FDA placed drugs in various categories. The drugs which are potentially teratogenic have been categorized as category 'D' and category 'X'[3]. This categorization was expanded to a more descriptive one. The Pregnancy and Lactation Labeling Final Rule (PLLR) came into effect in 2015. There are variable timelines for the implementation of this new information on drug labels[27]. Implementation of this rule occurred in several stages over three to five years from that date[28].

The new categorization system is more narrative and describes the risks involved as either low or high[29]. The high risk for teratogenicity is the same as category 'D' and 'X'.

Table 2.0 [33] Examples of Teratogenic Medications and the Associated Birth Defects:

DRUG	BIRTH DEFECT
Topiramate	Hypospadias, cleft palate
Lisinopril	Oligohydramnios, spontaneous abortion, renal dysfunction in newborn
Sodium valproate	Spina bifida, cleft lip/palate, development delays, Facial dysmorphology, congenital heart defects,
Paroxetine	Pulmonary hypertension and Cardiac malformations
Ondansetron	Cardiac malformations
Atorvastatin	Skeletal malformation in rats and congenital abnormalities in infants

1.2. Food and Drug Administration Pregnancy Categorization

The FDA pregnancy drug categorization has five classes lettered A, B, C, D and X'. Category 'D' and 'X' are termed teratogenic[30]. This categorization provides physicians with guidance on therapeutic use. Category A is safe, and B, C and D are used when the benefit outweighs the risk and x is contraindicated in pregnancy.

Table 3.0 FDA Drug Categorization[31]

Category	Description
A	Studies done show no increased risk of fetal abnormalities
B	Animal studies have revealed no evidence of harm to the fetus; however, there are no adequate and well-controlled studies on pregnant women. Or Animal studies have shown an adverse effect, but adequate and well-controlled studies in pregnant women have failed to demonstrate a risk to the fetus.
C	Animal studies have shown an adverse effect and there are no adequate and well-controlled studies on pregnant women. Or No animal studies have been conducted and there are no adequate and well-controlled studies on pregnant women.
D	Studies, adequate well-controlled or observational, in pregnant women have demonstrated a risk to the fetus. However, the benefits of therapy may outweigh the potential risk.
X	Studies, adequate well-controlled or observational, in animals or pregnant women have demonstrated positive evidence of fetal abnormalities. The use of the product is contraindicated in women who are or may become pregnant.

Despite the planned phasing out of the FDA-based classification in our country, it hasn't been phased out. This is according to information gathered on a visit to the Kenya pharmacy and poisons board. The main reason given was that the Kenya food and drugs authority bill 2019 had not been approved which would have given the board strength to initiate a Kenyan-specific categorization.

Most primary care providers will encounter a woman of reproductive age on potentially teratogenic drugs and thus it's their responsibility to initiate a discussion of the family planning needs of the patient.

The Pregnancy and Lactation Labeling Final Rule (PLLR) was effected in 2015. Gradual phase-out will be effected for the labelling of prescription drugs that were approved after 30th June 2001 but those submitted after 30th of June 2015 will be required to use the new format[27].

There is a narrative section for both pregnancy and lactation which has subsections. In the Pregnancy section, the subsections are Summary on risk, Data and Clinical Considerations and Registry on pregnancy exposure. Potentially teratogenic medications are prescribed in each internal medicine department. A study done in the USA showed that the greatest number of prescribers of teratogenic medications were primary care physicians[7].

1.3. Local Studies Implicating Drugs as Teratogens

Congenital anomalies are reported in approximately 3.5% to 5% of live births at delivery. At least 1% of these defects are attributable to drug use during pregnancy[32]. The degree of the disruption caused by the use of teratogenic drugs in women of childbearing age who may be pregnant could be underestimated because 65-70% of congenital anomalies have unknown causes. Complications arising due to pregnancy in patients using potentially teratogenic drugs can be prevented by certain mechanisms like the use of effective contraception and the improvement of physicians' knowledge on contraception provision among this population.

A study done in KNH between September 1983 and September 1984 and published in the International Journal of Health Sciences and Research showed 22.9% of mothers giving birth to babies with malformations were using drugs during pregnancy[33]. The same study showed 2.8% of all live births were malformed. This percentage represents 207 children with malformations out of the total number sampled which was 7355 [33][34].

Further within Africa, a study done in Egypt showed that counter medications may contribute to the occurrence of congenital anomalies[35]. Medication effect on pregnancy is immense and therefore women of reproductive age need to be given the right contraception when on teratogenic drugs.

1.4. Contraception Necessity

Contraception provision entails preconception counselling, prescription of contraception and referral to a gynaecologist for contraception. Patients must have a highly effective contraceptive method while on drugs with potential teratogenicity.

Prescription of effective contraception among primary caregivers is inadequate with most physicians[36] prescribing less effective barrier methods in place of highly effective long-acting reversible contraceptives. Primary care providers are uniquely placed and are a key pillar to contraception provision[37]

Prescription of teratogenic medication to women with rheumatic diseases predisposes the embryo to harm. Therefore, counselling on contraception should be a crucial part of care. In women at risk of getting pregnant while taking a potentially teratogenic medication, only 46% had documented contraception use[13].

An estimated 5.8% of all pregnancies in the USA have exposure to category D or X drugs but in rheumatic disease patients the specific rate is not known[36].

In the management of patients on teratogenic medication experts encourage contraception counselling as a vital part of holistic care[38]. Concerning care of patients with SLE, Gillis et al published a quality indicator statement that; women of childbearing age on drugs like methotrexate(MTX), mycophenolate mofetil(MMF), leflunomide(LEF), cyclophosphamide(CYC) before initiation of drugs, it's critical to discuss any potential teratogenic concerns and establish the need for contraception [39]

In 2004 the Arthritis foundation published a similar measure of quality statement for women with RA[38]. One-third to one-half of SLE patients do not have documented pre-drug initiation discussions regarding potential pregnancy risks[40]. Failure to adhere to the prescribed quality of measure guidelines increases the risk of harm to these patients but it also gives us a chance for improvement.

The decision for a contraceptive choice should be a shared decision between the physician and the patient. It has been observed in various studies that physicians rarely initiate communication on contraception choices in patients on teratogenic medications.

1.5. Birth Control Options

Effective contraceptive has a low failure rate in typical use [41] and can prevent pregnancy for up to three months without the need of using it daily. Human error such as forgetting to take your pill is taken into account in typical use as this is what happens in real life. When a contraceptive method

is used correctly all the time this is termed Perfect use. Human error is eliminated in Long-Acting Reversible contraceptives and for this reason, they are considered the most effective contraception.

Women of reproductive age on potentially teratogenic drugs should be placed on effective contraception and their contraception needs ought to be balanced. Primary care providers need to be adequately knowledgeable on effective contraceptives for they play a big role towards the provision of care to women who could be potentially pregnant while still on a potentially teratogenic drug[42]. Family planning options need to be individualized because some birth control options may have drug interactions with a prescribed drug. An example is the reduction of efficacy of oral contraceptives by some anti-epileptic drugs[43].

The reproductive health care aspect of contraception provision constitutes an important facet in the management of rheumatic disease patients because of the possible pregnancy-associated risks with active disease, severe disease-related damage and teratogenic medication. A large percentage of rheumatic disease patients are not on effective contraception. Oral combined contraceptives may be used in Antiphospholipid negative clients with stable systemic lupus erythematosus[44]. Estrogen-containing contraceptives should be avoided in Rheumatic disease patients with risk factors for thrombosis for example Anti-phospholipid positive patients. Both the rheumatologist and gynecologist should work closely to determine the most effective contraceptive for each patient.

Multiple modes of contraception administration exist including transdermal, intravaginal, intrauterine and oral routes. In the oral route, pills are not alike and adverse effects vary depending on the type of progestin present and estrogen content. In stable SLE, there is no increased risk of a flare-up when on standard oral contraceptives. In antiphospholipid antibodies, evidence however suggests an increased risk of thrombosis if on estrogen-containing contraceptives. Rheumatologists work with gynecologists' and patients to make individualized contraception plans cognizant of possible drug interactions, patient preference, patient medical status and desire for fertility.[45]

Evidence suggests that systemic lupus erythematosus patients can safely use most contraceptive methods plus hormonal methods. The benefits outweigh the risk of unplanned pregnancies in this population. Patients with antiphospholipid syndrome are however at an increased baseline risk of

thrombosis if on combined oral contraceptives.[46] Levonorgestrel intrauterine devices are preferred here and decrease menstrual blood loss.

In rheumatic patients, choosing a contraceptive is difficult yet crucial with the long-lasting preferred method of contraception. These would include progesterone intrauterine devices and subdermal implants. If at risk of osteoporosis or when using corticosteroids, DMPA (depot medroxyprogesterone acetate) is avoided due to ovulation inhibition. Highly effective contraception enables the timing of pregnancy during inactive disease and when on pregnancy-compatible medication to ensure optimal maternal and fetal health.

Table 4.0 [47]**Birth Control Options - Their Failure Rate and Frequency of Use**

BIRTH CONTROL OPTIONS	**Failure Rate**	**Frequency of use**
Sterilization of females	0.5%	Permanent
Sterilization of males	0.15%	Permanent
Intrauterine devices	LNG-0.2% COPPER T-0.8%	Lasts up to 3yrs-12yrs
Implants	0.05%	Up to 3yrs
Injectable	4%	Every 3months
Pills	8%	Every day at the same time
Patch	9%	Every time you have sex
Ring	9%	Every time you have sex
Diaphragm	12%	Every time you have sex
Male condom	13%	Every time you have sex
Female condom	21%	Every time you have sex
Effective withdrawal	20%	Every time you have sex
Sponge	12-24%	every time
Fertility awareness-based methods	24%	Daily
Spermicides	28%	Every time you have sex

Human Resource for Contraception Services in Kenya

Once they have received the required training, healthcare professionals from different cadres can participate in the delivery of FP services.

Similar to that, FP services can be offered at several levels of the healthcare system and in facilities run by multiple healthcare organizations.

To guarantee the delivery of high-quality services, these service providers must adhere to the MOH guidelines and standards for FP service provision [48].

Table 5: Provision of family planning methods by different categories of service providers.

PROVIDER/METHOD	Male condom, Female condom, Lactational amenorrhea method, Pills (combined oral pills) Injectables, Implants, IUDS	Voluntary surgical Sterilization.
Medical doctor	Provide full services related to the above.	
Nurse-midwives	Trained nurse-midwife can provide the full range of services related to the above.	Counsel Refer
Clinical officers	Adequately trained registered clinical officers can provide the full range of services	Counsel Refer

1.6. Guidelines on Contraception Provision

Each discipline in internal medicine has developed guidelines for the management of pregnant women on teratogenic medications. These guidelines assume pregnancies will be effectively planned which is not the case based on the degree of unplanned pregnancies worldwide. Neurologists, haematologist-oncologists, and dermatologists are the most implicated subspecialties in the prescription of drugs with potential teratogenicity. [49].

In patients taking methotrexate, it's recommended that they be on effective contraception during and six months after the final dose. In the setting of pregnancy, the European League Against Rheumatism (EULAR) has prescribed a framework for the cessation of the use of potentially teratogenic drugs[50]. The EULAR recommendation is based on the assumption that all pregnancies will be planned which is not always the case.

The current guideline by the American college of rheumatology strongly recommends:[51]

- Use of highly effective contraceptives preferentially IUDs is recommended in women with rheumatic disease who have lupus or APS;
- In women who test positive for anti-phospholipid autoantibodies or APS combined estrogen-progestin contraceptives should be avoided;
- Fertility therapy is recommended in women with stable disease who test negative for APL and have uncomplicated rheumatic disease and are receiving pregnancy-compatible medications;
- Before attempting conception men should not use cyclophosphamide or thalidomide;
- In the third trimester NSAIDs should be avoided.

Some medical conditions have direct effects on the outcomes of pregnancy therefore their management should be optimized before conception e.g. hypertension, thyroid disease, diabetes mellitus, rheumatic diseases and psychiatric illness[52]

To enable optimization, women must be on effective contraception. In women who plan to get pregnant, there is a need to either stop the medication or use an alternative drug where feasible. Women of reproductive age need to get adequate information on their reproductive health when on a potentially teratogenic medication.[53]

1.7. Risk Management of Potentially Teratogenic Medications and Pharmacovigilance.

To protect the embryo, teratogenic risk management is necessary. The FDA labels products in the USA to ensure safe use, among other risk management techniques. For isotretinoin (iPLEDGE), the U.S. Food and Drug Administration (FDA) has approved a mandatory risk management program to lower the risk of fetal exposure to teratogenic medicine [54].

In Kenya, the Pharmacy and Poisons Board has a department of pharmacovigilance whose role is to come up with an appropriate system for reporting, monitoring and detecting adverse drug reactions and other issues with drugs in our country[55]. Pharmacovigilance ensures the efficacy and safety of pharmaceutical products. An electronic reporting system (PV-ERS) was started in the pharmacovigilance department which is a suite of software applications for the collection and processing of information on suspected poor-quality medicinal products (sPQMPs) and suspected adverse drug reactions (sARDs). Since the establishment of this system, the department has been able to identify poor-quality products in circulation but they don't have any specific programs targeting potentially teratogenic drugs as of 15th January 2021.

1.8. Knowledge, Practices and Limitations in Contraception Provision

Despite a huge number of women of childbearing age with unplanned pregnancies and being prescribed potentially teratogenic drugs there is no shown difference between contraception provision in this population and women not on potential teratogens[56].

The knowledge and practice of primary care providers in other western countries concerning contraceptive provision has been analyzed and found inadequate. A study done by Dr David Eisenberg in 2010, showed 58% of physicians were able to identify teratogenic medications but had challenges providing effective contraception [57]. In the same study, physicians cited limited time of encounter with patients as a barrier. Other barriers recorded were poor reimbursement for counselling time, insufficient knowledge of contraception, insufficient knowledge of teratogens and poor communication between different physicians [36].

To augment the practice of contraception we will have a five question-questionnaire describing the type of contraception the women are using currently and whether they were prescribed in the clinic or they learnt of it elsewhere. We will also look at the teratogenic drugs being prescribed in

the rheumatology clinic and whether patients get preconception counselling before initiation of such drugs[13]. Patient care can be enhanced by providing highly effective contraception, improvement of pregnancy outcomes by conceiving during periods of inactive disease and allowing for continued control of rheumatic diseases during and after pregnancy with the use of well-suited medications[51].

During pregnancy, the prescription of medications is complicated by the inadequacy of knowledge regarding their compatibility leading to withdrawal/denial of disease-ameliorating therapies. This is an avoidable situation because flares of rheumatic diseases are associated with poor outcomes in pregnancy[58].

Knowledge Assessment Parameters

There is no single globally recognized system of knowledge assessment that is both de jure and de facto worldwide. There lacks a universal grading system similar to, the units used to measure weight (kg, g, mg) or distance (km, m, etc.). The integration of different governments into the global educational system is made significantly more difficult due to the lack of a unified international grading system causing significant uncertainty and greatly complicating the integration of various states in the world of education. In Kenya, the most commonly used grading scale is 0-100 points presented majorly in percentage. The seven-point scale has merged different grading parameters and it's a suitable scale to use for knowledge assessment[59]

The integrated seven-point scale is shown below **(Table 6.0)** and was applied to gauge knowledge among respondents in this study.

Table 6: Knowledge parameters

Knowledge parameters			
Level	**Grade**	**Points**	**Percentage**
Extra high	Perfect-A	7	**100**
High	Excellent-B	6	**90**
Above average	Good –C	5	**70**
Average	Moderate-D	4	**50**
Below average	Satisfactory-E	3	**30**
Low	Poor-F	2	**10**
Extra low	Bad-G	1	**0**

2.0. Study Justification

Contraception provision is an important aspect of standard health care. There is a need to bridge the gap in contraception provision in Kenya. Unplanned pregnancy due to the use of inadequate contraception can be worrying to any woman. The effect of an unplanned pregnancy can be more devastating, particularly for women with chronic illnesses [37]. Prescription of teratogenic medications to a woman of reproductive age should be done with caution.

Internal medicine residents are placed at a vantage point in the provision of contraception [7]. Women form the biggest population of patients who visit the hospital because in the population women form a higher number and also their health-seeking behavior is better. It is, therefore, necessary for residents to be knowledgeable on contraception provisions for women of childbearing age who are taking drugs with potential teratogenicity and also identify the barriers encountered so mitigation can be done. The choice of an effective contraceptive in women of reproductive age should be a shared decision-making process.

In chapter 1, Article 43(1) (a) of the Kenyan constitution each person has the right to the highest achievable standard of health, which is inclusive of the right to reproductive health care [60]. Comprehensive reproductive health care entails the provision of effective contraception and protecting the innocent fetus from harm that may be posed by the use of teratogenic medications.

Women between the age of 15 and 49 get prescriptions for drugs with potential teratogenicity and these women aren't prioritized for contraception. Physician knowledge of the teratogenic potential associated with the use of drugs in the categories D and X drugs in these women seems very low[7] despite the high level of unplanned pregnancies. Serious gaps in contraception provision among physicians ranging from lack of adequate knowledge in contraception have been shown in multiple studies[61]. Barriers identified in this study will be used to formulate interventions to enhance contraception provision by physicians.

3.0. RESEARCH QUESTION

What is the internal medicine residents' knowledge, practices, perceived barriers and interventions in contraception provision to women of reproductive age taking potentially teratogenic drugs?

Objectives

3.1. Broad Objective

To determine the internal medicine resident's knowledge, practice and limitations in contraception provision among women on potentially teratogenic medications.

3.2. Specific Objectives

I. To determine the resident's knowledge of potentially teratogenic medications.

II. Document resident's knowledge of contraceptive use in women of reproductive age on potentially teratogenic drugs

III. To determine residents' practice in contraception provision for women of reproductive age on potentially teratogenic drugs.

IV. To identify the resident's limitations and interventions towards improving the provision of contraceptives to women on medication with potential teratogenicity.

4.0. STUDY METHODS

4.1. Study design

A cross-sectional descriptive study was used using a structured self-administered questionnaire to collect data in keeping with the study objectives. The questionnaire was developed by Dr David Eisenberg [62]. Consent obtained to use it is attached to email appendix 3. The questionnaire comprised different questions aimed at addressing the areas of knowledge, practice and limitations in contraception provision on women of reproductive age on potentially teratogenic medications.

4.2. Study Site

The study was done at Kenyatta National Hospital, the teaching hospital for UON. This is a tertiary, teaching hospital with a bed capacity of over 1,800. It is also the main referral hospital in Kenya and East and Central Africa.

4.3. Study Population

The study populations were internal medicine Residents. The current number of Residents in the department of clinical medicine and therapeutics is 95.

4.4. Sample Size Estimation

The target population was internal medicine residents working at Kenyatta National hospital. All internal medicine residents studying at the University of Nairobi and doing clinical practice at Kenyatta National hospital were eligible for the study.

The minimum sample size was 76 as calculated by the Formula for finite population

(Less than 10,000).

$$n' = \frac{NZ^2P(1-P)}{d^2(N-1)+Z^2P(1-P)}$$

Where n' = sample size with finite population correction,

N = size of the target population (95 residents)

Z = Z statistic for 95% level of confidence = 1.96

P = Estimated proportion 50%

d = margin of error = 5%

n = **76**

4.5. Participants' Selection

4.5.1. Inclusion Criteria for Residents

- All residents in Clinical Medicine and therapeutics.
- Written, informed consent duly signed by the residents

4.5.2. Exclusion Criteria for Residents

- There were no exclusions

4.6. Sampling Procedures

The research assistant received guidance on how to reach the residents in their areas of work and issue them the questionnaire to fill out after approval was sought from the KNH/UoN Ethics Review Committee.

Data was collected through a hard copy delivered questionnaire. After the participant consented to participate in the study, he/she was given the questionnaire to fill out and was allowed to return it soonest possible.

4.7. Study Recruitment

Recruitment of participants who met the inclusion criteria was done at their workstations. They were approached and the study was introduced to them. A detailed explanation of the study was done.

The study participant was included upon giving both informed and signed consent.

To achieve the sample size, we repeated the process of recruitment until the sample size was achieved.

4.8. Study instruments

A structured self-administered questionnaire was used for data collection in keeping with the study objectives. The questionnaire was developed by Dr David Eisenberg. Consent obtained to use it is attached in email appendix 3. The questionnaire comprises different questions aimed at addressing the areas of knowledge, practice and perceived barriers in contraception provision in women of childbearing age on medication with potential teratogenicity. The questionnaire was administered in English as this is the language of instruction used in training doctors in Kenya (appendix 2).

The demographic data for residents involved gender, age, religion, years of practice and the year of residency.

To determine residents' knowledge of teratogenic medications, participants were asked to group medications as either–low teratogenic risk vs potentially teratogenic. A list of commonly prescribed medications in KNH was drawn with the assistance of the chief pharmacist. The list had 28 drugs of which ten were teratogenic. We also chose drugs commonly used in a rheumatology clinic. The rheumatology clinic was selected because rheumatic diseases tend to affect multiple systems. We drew a list of nine commonly used rheumatic medications and the residents were supposed to select three teratogenic medications from the list. The participants were required to arrange cyclophosphamide, methotrexate and mycophenolate in order of their teratogenic effects. The integrated seven-point scale was applied to gauge knowledge among respondents in this study. The teratogenic drugs knowledge parameters were graded as either above average, average or below average based on the mean percentage of the respondents who identified a drug correctly.

Knowledge of contraceptives was by multiple choice questions that focused on the use of LARCS, Emergency contraceptives, and the likelihood to get pregnant in 5yrs and also asked participants to identify the typical contraceptive rate of failure.

In practice, the information obtained from the participants was on establishing if they cared for women of reproductive age and the percentage estimate of women they saw in their practice. We

also sought to know if residents had counselled, prescribed or even referred women of reproductive age for contraception provision. In the course of caring for women on teratogenic medications, we wanted to establish if they had changed, withheld or discontinued the teratogenic medications. The tools of reference for the identification of teratogenic medications were an important aspect of the questionnaire.

Perceptions of medical education on the prescription and counselling of contraceptives and teratogenic drugs were evaluated using four-point Likert scale questions.

The ability of participants to frequently offer contraception to women using potential teratogens was asked to be rated, along with any limitations and potential interventions they considered would be most helpful. A blank page was left at the end of the questionnaire for residents to add any other limitations or interventions they thought would impact the provision of contraceptives.

4.9. Quality Assurance.

The questionnaire is a validated tool[36]. The questionnaire has gone through internal and construct validation. There was no need to translate the questionnaire to Kiswahili since English is the primary language of instruction in medicine. The principal investigator ensured all questionnaires were fully completed upon receipt.

5.0. ETHICAL CONSIDERATIONS

5.1. Approval by the Ethics Committee

Permission was sought to carry out the research from the University of Nairobi /Kenyatta National hospital's ethical and research committee.

5.2. Voluntary and Consent

Both informed and signed consent was sought for participants who met the inclusion criteria. There was no coercion of whatever kind for participants to take part in this study. Consent was sought through a comprehensive explanation of what the study is all about.

5.3. Confidentiality

Information gathered in this study was kept private and respondents were protected. There was no use of personal identifiers.

5.4. Anonymity

The identity of participants was protected by using numbers, codes and pseudo names.

5.5. Physical and psychological harm

There were no risks anticipated in this study.

5.6. Disclosures

No conflict of interest in the study.

6.0. DATA MANAGEMENT

6.1. Data Handling

Collected data was kept confidential. Participants of the research were not revealed as there was no use of the full names of the participants. Questionnaires was collected and checked to see if they were filled correctly. Data collected was kept secure and will not be shareable for duplication by any other researchers. Collected data from the questionnaires was filled in a Microsoft excel sheet which is password protected. The Raw data was only kept by the principal investigator. Data gathered during this study was evaluated by the supervisors and was authenticated by faculty members at the department of internal medicine.

6.1.1. Data Analysis

Statistical Package for Social sciences (SPSS) version 27 was used for statistical analysis. We used frequencies and mean percentages to summarize the data. Data entry started as soon as each questionnaire was returned to the principal investigator. Data entered was proofread for errors of omission or commission. This was done by scrutinizing the entered data against the hard copy questionnaire. Mistakes identified during data entry were corrected promptly. Data collected was cleaned and validated to ensure the reliability of the study. Data was backed up in a flash disk and a compact disk to prevent data loss. Assistance from a qualified biostatistician was sought to offer guidance on data analysis.

To determine knowledge of potentially teratogenic drugs the participant selected against a list of drugs and ticked their teratogenic risk. The data was measured by the overall mean percentage of those who identified the drug category correctly.

The knowledge of contraceptives was assessed by determining the correct responses to the multiple-choice questions that covered long-acting reversible contraceptives, emergency contraceptives and the likelihood of getting pregnant in five years. On contraceptive failure rates, the participant was required to mark the percentage of women likely to get pregnant within a year of the normal use of specific birth control methods. This section was measured by the overall mean percentage that identified the drug category correctly.

On practice, the participant answered questions like whether they counsel patients on contraception and whether they ever prescribe contraceptives in their practice. The participant also answered a question on whether they refer patients on potentially teratogenic drugs and this data was analyzed in mean percentage.

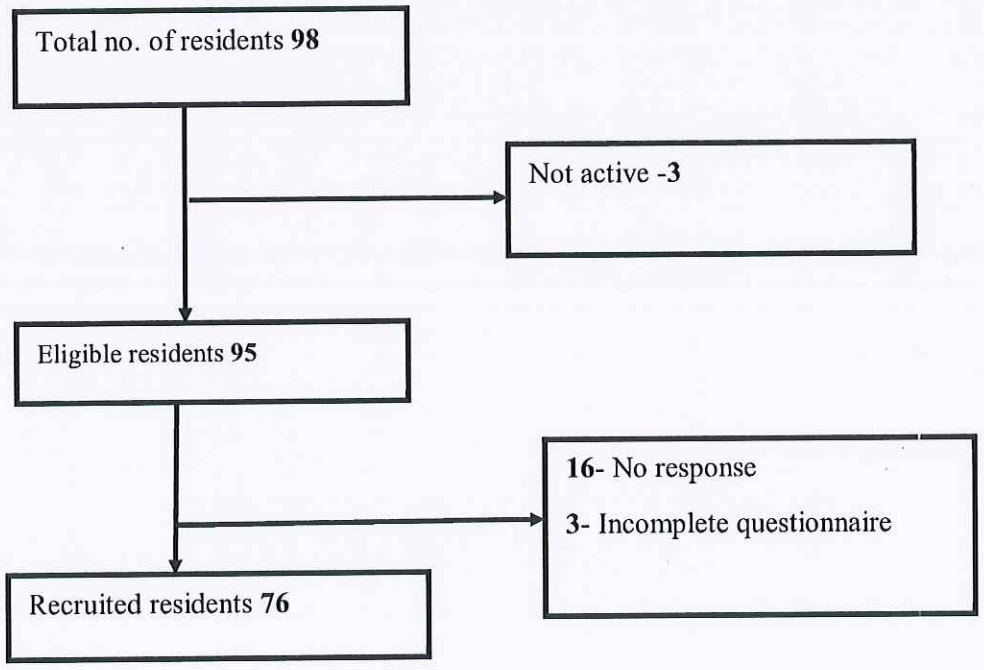
On limitations in contraception provision, the participant ticked against the barriers he/she felt hindered their provision of contraception to women of reproductive age on potentially teratogenic drugs. They were also required to list interventions to improve contraception management for women of reproductive age for whom potentially teratogenic drugs have been prescribed. The data was summarized in mean percentage.

RESULTS

A total of 95 internal medicine residents were identified to participate in the study. Out of this number we got 79 responses but three were eliminated due to an incomplete questionnaire. Sixteen residents didn't respond.

The overall response rate was 80.0%.

Figure 1: Flow Diagram for the enrolled study residents.



DEMOGRAPHICS OF THE RESIDENTS

Table 7.0 summarizes the demographics of the residents. Most of the participants were in their 3rd year of study (44.7%), and the majority had been in practice from 2015 and above (51.3%, n= 39).

Demographic characteristics Table 7.0.

	Frequency, *n=76*	**Percent**
Gender		
Male	34	44.7
Female	42	55.3
Age		
≤ 35	66	86.8
> 35	10	13.2
Religion		
Christian	70	92.1
Muslim	6	7.9
Year of graduation from medical school		
Before 2015	37	48.7
2015 and above	39	51.3
Year of residency		
1	18	23.7
2	24	31.6
3	34	44.7

6.2. KNOWLEDGE OF TERATOGENIC MEDICATIONS: GENERAL MEDICATIONS

On the potentially teratogenic medications, **45.4%** were able to accurately classify the high-risk drugs. The overall mean percentage identified correctly was below average at **34.4% as shown in table 8.0**.

Table 8.0: Teratogenic medications knowledge.

Teratogenicity	**Drugs**	**Mean % correctly identified**
No risk of Teratogenicity	Levothyroxine, cetirizine, clopidogrel, esomeprazole, pantoprazole, Montelukast, sildenafil, lansoprazole	**21.9**
Low risk of teratogenicity(C)	Amitriptyline, ciprofloxacin, escitalopram, Ezetimibe, fluticasone/salmeterol, Levofloxacin, metoprolol, sertraline, Venlafaxine, amlodipine	**32.2**
Potential teratogens	Candesartan, enalapril, losartan, alprazolam, Carbamazepine, doxycycline, diazepam, Phenytoin, atorvastatin, warfarin	**45.4**
Overall mean correctly identified		**34.4**

Most of the respondents (72.3%) incorrectly identified methotrexate as more teratogenic than cyclophosphamide and mycophenolate

On identification of teratogenic drugs, methotrexate was correctly selected by 90.8% of respondents, cyclophosphamide by 86.8%, and mycophenolate by 21.1%. Leflunomide was

incorrectly selected by 36.8%. Other rheumatic drugs safe in pregnancy were selected as teratogenic as shown in **table 9.0.**

Table 9.0: Knowledge on Rheumatic Teratogenic Medications

	Frequency(n=76) Correctly identified	**Percent correctly identified**
Prednisone	5	6.6%
Methotrexate	69	90.8%
Cyclophosphamide	66	86.8%
Leflunomide	28	36.8%
Cyclosporine	14	18.4%
Hydroxychloroquine	17	22.4%
Azathioprine	4	5.3%
Mycophenolate	16	21.1%
Adalimumab	3	3.9%

6.3. KNOWLEDGE ON CONTRACEPTIVES

6.3.1. Long-acting reversible contraception (LARCS) and emergency contraception.

Only 28.9% of residents ascertained that women with lupus or antiphospholipid syndrome have no contraindications to using a hormonal IUD. However, several respondents indicated that the IUD might not work in immunosuppressed women (13.7%), or that the hormones in the IUD might increase the thrombotic risk (57.5%).

The majority of the respondents thought emergency contraception pills contained estrogen only. 52.6% of respondents correctly answered that emergency contraception couldn't cause an abortion.

Only 16.2% of residents correctly approximated the likelihood of getting pregnant while on condoms, Depo-Provera and Mirena IUD. Results are summarized in table 10.0.

Table 10.0: Knowledge on LARCS and ECPs.

LARCS&ECP KNOWLEDGE	FREQUENCY (n=76) of those who identified correctly.	MEAN % CORRECT
What is contained in Hormonal IUD?	22	28.9%
Hormone in emergency contraceptive pill? -estrogen	41	54%
Likelihood of pregnancy over 5yrs of use of-Mirena/condom/Depo-Provera.	12	16.2%
Emergency contraception cause abortion?	40	52.6
Mean percent correctly identified 37.9		

6.3.2. Knowledge of Contraceptive Failure Rates

For responses on failure rates of contraceptives, the mean percent correct was 39.0%. Respondents were less likely to accurately identify failure rates for less dependable means of contraception, such as barrier techniques (mean 8.9%), than for more reliable methods, such as hormonal contraception (30.3%) and sterilization (mean 63.2%). The correct failure rate and the percentage that was correctly identified is highlighted in bold colour on **table 11.0**. For further understanding of this table, the correct failure rate is described in **table 4.0**. The mean percent correct for each contraceptive method is listed in Table 11.0.

Table 11.0: knowledge on contraception typical failure rate

Method/failure rate %	<1%	1-5%	6-10%	11-20%	>20%	Not sure
Less effective Natural family planning						
Timing/ Rhythm methods	5 (6.6)	6 (7.9)	11 (14.5)	8 (10.5)	**39 (51.3)**	7 (9.2)
Withdrawal	5 (6.6)	4 (5.3)	10 (13.2)	10(13.2)	**40 (52.6)**	7 (9.6)
Mean correct Barrier methods					**52%**	
Male condoms	7 (9.2)	27 (35.5)	22 (28.9)	**6 (7.9)**	5 (6.6)	9 (11.8)
Female condoms	8 (10.5)	29 (38.2)	17 (22.4)	9 (11.8)	**7 (9.2)**	6 (7.9)
Diaphragm/ Cervical cap	8 (10.5)	28 (36.8)	19 (25)	**6 (7.9)**	4 (5.3)	11 (14.5)
Spermicides	8 (10.5)	21 (27.6)	23 (30.3)	7 (9.2)	**8 (10.5)**	9 (11.8)
Mean correct (8.9%) Hormonal methods						
Hormonal contraception	17 (22.4)	36 (47.4)	**11 (14.5)**	4 (5.3)	2 (2.6)	5 (6.6)
Injectable	25 (32.9)	**26 (34.2)**	12 (15.8)	4 (5.3)	3 (3.9)	6 (7.9)
Implantable subdermal	**32 (42.1)**	22 (28.9)	6 (7.9)	5 (6.6)	3 (3.9)	8 (10.5)
CORRECT MEAN % (30.3) Other methods						
Intrauterine contraceptives	**31 (40.8)**	28 (36.8)	6 (7.9)	4 (5.3)	0 (0.0)	7 (9.2)
Sterilization	**48 (63.2)**	15 (19.7)	5 (6.6)	0 (0.0)	1 (1.3)	7 (9.2)
OVERALL CORRECT MEAN (39.0%)						

6.4. Practice Characteristics

In the past year, the majority of participants (96%) provided care for women of reproductive age who were taking potentially teratogenic drugs. Because of concern about potential exposures to teratogens, the majority of respondents said they have delayed prescribing (34.2%), changed, or stopped using drugs (50%) potentially teratogenic drugs. When identifying potential teratogens' pregnancy risk, respondents were asked about the sources they rely on. The vast majority of

respondents, 52.6%, report using up-to-date as the preferred reference for teratogenic medications. Website or online resources and consulting another physician were also other notable modes of reference for the residents. A low number of residents admitted to prescribing contraception. On which contraceptive method they would prefer to prescribe most residents selected moderately effective methods 36%. Referrals for contraception were mostly to a gynaecologist. Information is summarized in table 12.0.

Table 12.0: Practice information on residents' provision of contraception to women on teratogenic medications (n 76).

The proportion of patients attended clinics who are women of reproductive age.	**73.7% of residents attended more than 50% of women in a clinic visit.**
Cared for a reproductive-aged woman in the last 12 months	**96%**
Cared for women during pregnancy	**90.8%**
Counsel about contraception	**57.9%**
Prescribe contraception	**10.5%**
Recommended emergency contraception	**14.5%**
Referred a patient for (contraception counselling, prescription, emergency contraception)	**44.2%**
Referrals mostly to the gynaecologist	**88.2%**

In order of priority important items during counselling on teratogenic medications were: Patient counselling performed by a physician (82.9%), Patient counselling by a nurse or other healthcare provider 55.3% and pre-printed material given to the patient at the time of her office visit. Residents preferred modes of reference in **table 13.**

Table 13.0 Methods/Items you believe are most important when prescribing or counselling a patient about potential adverse effects.

	First	Second	Third
Patient counselling performed by the physician	**63 (82.9)**	4 (5.3)	3 (3.9)
Patient counselling performed by a nurse or other healthcare provider	4 (5.3)	**42 (55.3)**	8 (10.5)
Pre-printed material was given to the patient at the time of her office visit	0 (0.0)	10 (13.2)	**26 (34.2)**
Package insert included in the prescription.	2 (2.6)	9 (11.8)	11 (14.5)
Information provided by the pharmacist	6(7.9)	5 (6.6)	24 (31.6)
Referral to reference books	1 (1.3)	3 (3.9)	1 (1.3)
Referral to websites	1(1.3)	0 (0.0)	0 (0.0)

Resident's Perceptions Regarding Counselling and Prescribing

Most (72.3%) residents reported they feel it is the responsibility of the PCP to provide family planning and contraceptive services. When asked about their likelihood to prescribe various contraceptive methods to women on potentially teratogenic medications, most of the respondents reported they were somewhat or very likely to prescribe oral contraceptive pills, implantable hormonal contraceptives, intrauterine devices or refer to another provider for sterilization. As detailed in Table 14.0, most respondents believed they had not been adequately prepared to counsel or administer contraceptives by their medical school or residency training. However, more than half (60.6%) felt that their internal medicine residency had given them the necessary training to offer advice regarding potential teratogens.

Table 14.0: Perceived barriers in training.

	SD	D	A	SA
It is the responsibility of primary care physicians to provide family planning and contraceptive services	7 (9.2)	14 (18.4)	28 (36.8)	27 (35.5)
Medical school adequately prepared me to counsel about and prescribe contraceptives	15 (19.7)	25 (32.9)	**27 (35.5)**	9 (11.8)
Residency training adequately prepared me to counsel about and prescribe contraceptives	19 (25)	**25 (32.9)**	20 (26.3)	12 (15.8)
Medical school adequately prepared me to counsel patients about potentially teratogenic medications	12 (15.8)	20 (26.3)	**35 (46.1)**	9 (11.8)
Residency training adequately prepared me to counsel patients about potentially teratogenic medications	12 (15.8)	18 (23.7)	**29 (38.2)**	17 (22.4)
I would benefit from CME in counselling patients about potentially teratogenic medications	7 (9.2)	7 (9.2)	28 (36.8)	**34 (44.7)**
I would benefit from CME in counselling patients about contraception	3 (3.9)	6 (7.9)	28 (36.8)	**39 (51.3)**
I feel I have access to adequate resources/references to help me care for women who need contraception while on class D or X medications	8 (10.5)	22 (28.9)	**24 (31.6)**	21 (27.6)

SD – Strongly disagree, D – Disagree, A – Agree, SA – Strongly agree

Identification of Barriers and Potential Interventions

Most respondents identified a lack of communication with other doctors treating the same patient 81.6% when asked to indicate how limited participants felt by a selection of potential barriers to

delivering sufficient contraception to women taking potential teratogenic medications. Other items that most participants felt limited by are Lack of knowledge about contraceptive methods 80.2%, time constraints 77.6% and the expectation that another provider was involved 76.3%. The inability to bill for the counselling time was found not limiting. Other significant limitations are listed in **Table 15.0**

Table 15.0: Limitation on the ability to provide contraceptive counselling

	Not too limiting	**Somewhat limiting**	**Very limiting**
Time constraints	17 (22.4)	**28 (36.8)**	**31 (40.8)**
Inability to bill for the counselling time	**38 (50.0)**	17 (22.4)	21 (27.6)
Lack of knowledge about contraceptive methods	15 (19.7)	**35 (46.0)**	26 (34.2)
Lack of knowledge about potentially teratogenic medications	24 (31.6)	**28 (36.8)**	24 (31.6)
Expectations that another provider is involved	18 (23.7)	**31 (40.8)**	27 (35.5)
Lack of communication with other physicians caring for the same patient	14 (18.4)	**30 (39.5)**	32 (42.1)
Inability to share medical records with other physicians caring for the same patient	18 (23.7)	20 (26.3)	**37 (48.7)**

On interventions, most respondents (97.4%) agreed they are interested in obtaining more information. Specifically, the vast majority agreed they would benefit from continuing medical education on counselling patients about contraception (88.1%) and potential teratogens (81.5%). 97.4% of respondents agreed that a laminated pocket reference regarding teratogenic medications sorted by therapeutic category would be useful, whereas 98.7% reported that a pregnancy risk classification system that is evidence-based would be worthwhile. 94.7% of participants felt all potentially teratogenic medications should have contraceptive compliance programs. Referral or telephone consultation services for assistance in providing appropriate contraception for women on potential teratogens would be useful interventions proposed by 97.4% of residents. Other highlighted interventions are listed in **Table 16.0**

Table 16.0: Interventions in enhancing contraception provision

	SD	D	A	SA
I am interested in obtaining more information on these subjects	1 (1.3)	1 (1.3)	30 (39.5)	**44 (57.9)**
A laminated pocket reference of potentially teratogenic medications sorted by therapeutic class would be useful	1 (1.3)	1 (1.3)	26 (34.2)	**48 (63.2)**
An alert in the electronic medical record (similar to an allergy alert) about a need to discuss/prescribe contraception when prescribing a potentially teratogenic medication would be useful	1 (1.3)	0 (0.0)	30 (39.5)	**45 (59.2)**
All potentially teratogenic medications should have a contraceptive compliance program.	2 (2.6)	2 (2.6)	28(36.8)	**44 (57.9)**
I would use a referral service for contraceptive counselling for women with underlying medical conditions or taking class D or X medications if it was available	1 (1.3)	4 (5.2)	26 (34.2)	**45 (59.2)**
I would use a telephone consultation service for questions regarding providing contraception to women with underlying medical conditions if it was available	2 (2.6)	0 (0.0)	26 (34.2)	**48(63.2)**
It would be useful to have information about potential teratogens that is designed for patients to understand	1 (1.3)	1 (1.3)	26 (34.2)	**48 (63.2)**
A pregnancy risk classification system that is evidence-based would be useful	1 (1.3)	0 (0.0)	19 (25)	**56 (73.7)**
I feel it is important to have medication reference tools that are handheld	1 (1.3)	2 (2.6)	18 (23.7)	**55 (72.4)**
I would benefit from hands-on training to use currently available resources	1 (1.3)	1 (1.3)	25 (32.9)	**49 (64.5)**

8.0. DISCUSSION OF RESULTS

This study aimed to describe the knowledge, practices, barriers and interventions in improving contraception provision in women of reproductive age taking potentially teratogenic medications. The results suggest that internal medicine residents lack knowledge of teratogenic medications and knowledge of contraceptive failure rates and this was in keeping with previous studies mostly done in the west[63] [36]. The explanation could be due to the expectation that the internal medicine residents would refer to a gynaecologist who would be able to change the drug. The other explanation could be inexperience which may improve upon sub-specialization. However general studies done on physicians and rheumatologists showed a lack of adequate knowledge of teratogenic drugs and contraceptives[63].

Raising awareness is an important intervention towards reducing fetal exposure to potential teratogens. Such awareness campaigns should be focused on improving the knowledge of prescribers concerning the need for women taking potential teratogens to be on a highly-effective contraceptive[64]. This could decrease exposures and possibly lower the rate of teratogenic-induced congenital anomalies. Residents frequently counselled their patients on contraceptives but the majority never prescribed contraceptives. The assumption could be the expectation that a gynaecologist would prescribe the contraceptive. From the Kenya family planning guidelines, any medical doctor should be able to prescribe contraception[48] therefore the responsibility of contraception provision should not be delegated. The prevention of teratogenic exposure by the provision of highly-effective contraception decreases potential harm to both mother and fetus.

Regarding Knowledge of teratogens and contraceptives residents lacked sufficient knowledge of both teratogenic medications and contraceptive method failure rates. This implies that residents were inadequately equipped to comprehensively take care of women of reproductive age taking potentially teratogenic medications.

The overall correctly identified teratogens was 34.4% for commonly used drugs in KNH. These drugs are also commonly used in most internal medicine specialities like cardiology, gastroenterology and neurology and this could affect the care of women of reproductive age in those clinics. The standard of care is that residents in different speciality rotations are often called to review obstetrics and gynaecology patients in the wards and if they are ill-equipped with knowledge on the use of teratogenic medications their advice may be detrimental to a pregnant

mother. The overall mean correctly identified was lower than a study done by Eisenberg[36] whose mean was 58.4%. The plausible explanation for this could be that the study population in that study was physicians who had more working experience than residents. In our study, we requested the residents not to refer to any material when responding to the questions which was not the case in other previous studies[36].In the 7-point scale scoring this percentage is below average and this could have a direct effect on patient care[59].

There was an overestimation of drugs that are of low risk of teratogenicity as potentially teratogenic and the implication of this is that patients might be denied crucial medications during pregnancy. This finding was in keeping with the findings of a similar study which showed there was an overestimation of low-risk teratogenic drugs as high-risk teratogenic drugs[36].

Concerning drugs that were potentially teratogenic medications, residents were able to correctly identify 45.4%. This score is below average and it implies the inadequate ability to comfortably change or discontinue potentially teratogenic medications in women of reproductive age. A score above 70% is considered good and a score of 50-69% is average according to the 7-point knowledge parameter score which is widely accepted[59].

Most residents were able to correctly pick teratogenic rheumatology drugs from a list of nine medications. Methotrexate 90.8%, cyclophosphamide 86.8%, mycophenolate 21.1% with an overall mean correctly identified of 32.5%.Though other medications not categorised as potentially teratogenic were selected this was in contrast to a study that was done on rheumatologists who had correctly identified hydroxychloroquine and prednisone as low risk drugs[63]. These teratogenic medications need to be stopped in advance before a patient gets pregnant. Identification of most of the medications like prednisone, leflunomide and hydroxychloroquine as teratogenic means patients might have non teratogenic medications stopped to their disadvantage. The explanation on this could be because the rheumatologists had expansive experience compared to residents. Most residents placed mycophenolate as less teratogenic in comparison to cyclophosphamide and methotrexate. Only 21.1% of residents identified mycophenolate as teratogenic. The underestimation of mycophenolate's' teratogenic effects means most residents would have used it in women of reproductive age who may be on less effective contraception and this would lead to foetal harm.

Where the percentage failure rate of contraceptives was not listed majority of residents failed to correctly indicate the likelihood of pregnancy in over 5yrs of contraceptive use. Most of the residents incorrectly identified emergency contraceptives to contain oestrogen and half incorrectly answered that emergency contraceptives can cause abortion. When given choices with stated percentages the overall correct mean who identified failure rate was 39.0%This finding was in keeping of several studies which had found healthcare providers had inadequate knowledge on contraceptives[65] [66] [36] [11]. This finding means residents lack adequate knowledge on contraceptive methods failure rates and this may lead them to choose a less effective method of family planning leading to high chances of pregnancy in a patient taking a potentially teratogenic drug. Though this would be mitigated by referral to gynaecologist the cost implications and time wasted before the patient is attended to may pose a danger to the health of a foetus. Also given the limitation in time constraints counselling may be ineffective and this may lead the patient to take lightly the need to see another doctor.

Concerning resident's practice ninety six percent of the residents reported they encountered a woman in her reproductive age on a potentially teratogenic medication in the past 12months.In their practice most residents reported the percentage of patient population who are women of reproductive age was more than 50%. The significance of this is residents are placed at a vantage point to enhance quality of reproductive healthcare to women of reproductive age[7]. When discussing a potentially teratogenic therapy with patients, residents should address the urge to avoid pregnancy and available contraceptive choices. When explaining the potential risks of teratogenic drugs, it is crucial that residents are knowledgeable about extremely effective contraceptive techniques to prevent pregnancy. Though most residents reported having counselled patients on contraception (57.9%) in practice most residents preferred referral to a gynecologist for contraception prescription. This was in keeping with the study done by Eisenberg[36]. The implication of this is the patient would require to pay double consultation and also experience delays before getting a review by the gynecologist. It also would imply they would be at high risk of being on a less effective contraceptive for the period of delay before being seen by a gynecologist. If given a chance to prescribe most residents would have prescribed a moderately effective method. This means the patient would have been denied a highly effective contraceptive method while on a potentially teratogenic medication. According to the Kenyan family planning

guidelines any trained medical doctor is responsible for providing the whole range of family planning care including voluntary surgical sterilization[48].

Most of the residents reported they consulted a physician as the source of reference on teratogenic medications. Notably from a number of previous studies physicians demonstrated inadequate knowledge on teratogenic medications [36] [56]. The limitation of this approach was most physicians in previous studies also preferred to refer such patients to a gynecologist and this could contribute to delays before getting a highly effective contraceptive. Because of double consultation payment a referral to a gynecologist has a financial implication to the patient and the patient may end up not honoring the referral. Despite residents demonstrating low knowledge on teratogens a majority reported to have discontinued and changed teratogenic medications which implies a possibility of stopping a drug that was not teratogenic to a teratogenic one and vice versa. It's therefore important for residents to update their knowledge on teratogenic medications.

Concerning the most important items during prescription and counselling on teratogenic effects information provided by the pharmacist ranked 4th below counselling performed by the physician and counselling performed by a nurse. This was contrary to the findings from a previous study that showed information provided by pharmacist ranked high[36]. Though in a study done in Ethiopia pharmacists were found to have inadequate knowledge on teratogens[4] in the Kenyan family planning guidelines pharmacists play a significant role[48]. Pharmacists are the last healthcare providers before the patient exits the hospital and there seems to be no direct link between the pharmacist and the resident. For sharing of knowledge on adverse effects especially teratogenicity it is necessary to improve the linkage between the pharmacists and residents at the point of patient care as opposed to at the point of drug dispensation.

On limitations and perceived barriers majority of respondents felt limited by lack of communication with other physicians caring for the same patient[56]. Additional limitations included the lack of knowledge of potential teratogens or contraceptive methods to prevent fetal exposures. Inability to bill for counselling time was found not limiting as opposed to a previous study that found it limiting. Time constraints in our study was found to be limiting by 76.8% of the residents which was in contrast to Dr. Eisenbergs findings. The plausible explanation for this could be because of the different regions of practice and the huge number of patients a resident would see in a given clinic visit as opposed to a qualified physician.[36].

To effectively enhance quality of reproductive healthcare, it is important to understand resident's knowledge and what barriers they perceive in their practice. The perceived barriers can give guidance to the interventions needed.

The majority of respondents thought that bedside and portable instruments would be helpful for interventions. Many of the participants in this survey believed that their training in internal medicine during medical school and/or residency was insufficient to prepare them to offer contraception or to handle conversations about potentially teratogenic medicines. Residents should be able to use self-directed learning to improve their knowledge on contraception and teratogenic medications. In order to ensure exposure to clinical settings that would serve as training in this area, it is important to strengthen the curricula for medical school and residency programs. The need to identify alternatives to minimize teratogenic exposure could be emphasized through the development of a continuing medical education program. The residents should be able to familiarize themselves with the latest guidelines on family planning. In contrast, residents with less experience with contraception should refer patients taking possibly teratogenic medications to another healthcare provider, such as a gynecologist or other expert in women's health [48]. This was demonstrated in this study where most of the residents preferred to refer. However, due the population that we encounter in the public healthcare setting, it is important that residents are equipped with knowledge and quick references like reference on smartphone, to curb any delays in care that may be transferred to the patient.

It is unreasonable to anticipate that residents will always be knowledgeable about teratogens and contraception given the variety of patients they treat. Furthermore, there is an enormous number of patients in our clinics, and the majority of them have additional underlying medical conditions to discuss, which leaves little time for the resident to properly counsel or give contraception. The residents should be able to use available reference materials at their disposal to counsel patients.

9.0. Conclusion

In conclusion, from our study.

The resident's knowledge on teratogenic medications was below average.

Most rheumatic medications were identified as teratogenic yet they were safe medications.

Overall knowledge on contraceptives including knowledge on emergency contraceptive, long-acting contraceptives and the contraceptives typical failure rate was below average.

In practice Residents attended to above 50% of women. Majority of residents never prescribed contraceptives to women on teratogenic medications. Most residents referred women of reproductive age for contraceptive prescription to a gynaecologist and preferred uptodate as the accessible mode of reference.

The most notable limitations on contraception provision were lack of communication with other physicians caring for the same patient, lack of knowledge about potentially contraceptive methods and time constraints.

Interventions that were strongly advocated included a). All potentially teratogenic medications should have a mandated contraceptive compliance program b). A laminated pocket reference of potentially teratogenic medications sorted by therapeutic class would be useful c). A pregnancy risk classification system that is evidence-based.

10. Study Limitations

(I). The study can't be generalized. The findings of this study will only apply to the current day internal medicine residents.

(II). Filling of the questionnaire was not supervised thus some of the participants may have referred to materials at their disposal before responding to some of the questions. Though at the beginning of the study residents were instructed not to refer to any material.

11. Recommendations

a) We recommend continuous medical education to guide on best practice on teratogenic medication and updates on any new research concerning teratogens.

b) Existing guidelines on contraceptives to be widely shared to residents. Charts can be placed strategically in the clinics to enhance quick reference.

c) Emphasis should be made to ensure that the responsibility on contraception provision is not compartmentalized solely to gynecologists.

d) Provision of handheld packages for easy reference of teratogenic medications.

e) To mitigate the challenge of time constrain policy changes to ensure clinics book manageable numbers so residents can have adequate time for patient counselling and ensure contraception provision.

f) Linkage between gynecologists and residents during clinic visits so patients can get comprehensive care in same visit.

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APPENDICES

APPENDIX 1- RESIDENTS CONSENT EXPLANATION FORM

Title of the study: UON internal residents' knowledge, practices and barriers in contraception provision among women on potentially teratogenic medications.

Principal investigator: Dr. Fredrick Mumo Mwaka.

Introduction

I am Dr. Fredrick Mumo Mwaka, from the University of Nairobi. I am currently doing my postgraduate studies in Internal Medicine. As part of my postgraduate studies, I am required to do a research project. I am undertaking a study on **UON internal medicine residents' knowledge, practices and barriers in contraception provision among women on potentially teratogenic medications.**

Purpose of the study

The aim of the study is to assess the residents' knowledge, practice and limitations in provision of effective contraception for women of reproductive age taking potentially teratogenic drugs.

Procedures Involved

This survey will take approximately 15minutes. The study will involve filling a questionnaire with questions targeted at gaining the internal residents' knowledge, practice and limitations in provision of contraception for women of reproductive age with rheumatic diseases taking potentially teratogenic drugs. Information to collect will include demographic data. On the questionnaire you will be required to tick against a drug to indicate whether it is potentially teratogenic or not and this will help determine the knowledge on teratogenic medications.

Your rights as a participant in this study

Your participation in this study is voluntary. You are free to terminate the interview and withdraw from the study at any time. You are free to ask questions before signing the consent form and during the study. Confidentiality will be maintained at all times

Risks of participation

There are no risks involved in this study.

Benefits of participation

At the end of the study, I will hand over the findings to the Internal Medicine department of UON. Any useful information will be used to improve policy formulation within Kenyatta National Hospital in ensuring physicians are able to provide contraception to women of reproductive age who are taking potentially teratogenic medications.

Confidentiality

All information gathered during the study will be kept confidential. Only researchers have access to personal information. Information gathered will be documented and analyzed anonymously.

If you have any question during the course of the study, you may contact the following:

1. DR. Fredrick Mumo Mwaka, UNIVERSITY OF NAIROBI,
   DEPARTMENT OF CLINICAL MEDICINE AND THERAPEUTICS,
   Mobile: 0716405726. ***OR***

1. CHAIRPERSON, KNH/UON ETHICAL REVIEW COMMITTEE,
   TEL: 020-2726300/0722829500/0733606400/EXT 44102. P.O. Box 20723, Nairobi.

Before I involve you in my study, I kindly ask you to sign the attached consent form below. This consent form will not be linked to your answers.

APPENDIX 2: Resident's Consent.

STUDY NO……..DATE……TIME……

I hereby give my written and informed consent to allow myself ……
participate in this study on Uon internal Medicine residents' knowledge, practices and barriers in contraception provision among women on potentially teratogenic medications.

I have been adequately explained to about the study by Dr. Fredrick Mumo Mwaka/his assistant. I do this with the full understanding of the purpose of the study and procedures involved which include filling in a questionnaire which have been explained to me. I understand that my rights will be respected, and confidentiality maintained at all times.

I also understand that the consent is voluntary, and I am at liberty to withdraw from the study.

Participant's Name……

Participant's Signature……

INVESTIGATOR'S STATEMENT

I, the Principal Investigator, have fully educated the research participant on the purpose and implication of this study.

Signed…… Date……

For any further clarification, you may contact

Dr. Fredrick Mumo Mwaka, at Tel No: 0703117141.

Or: KNH/ERC (Kenyatta National Hospital/Ethics & Review Committee)

TEL: 020-2726300/0722829500/0733606400/EXT 44102. P.O. Box 20723, Nairobi

APPENDIX 3: QUESTIONNAIRE:

RESIDENT'S DEMOGRAPHIC DATA

STUDY NUMBER .....

NAME (INITIALS) .....

AGE .....

GENDER .....

YEAR OF GRADUATION FROM MEDICAL SCHOOL .....

YEAR OF RESIDENCY .....

Appendix: Written version of survey

- This list contains some of the most commonly prescribed medications in KNH.
- Indicate whether you believe each medication is classified as low teratogenic risk or potentially teratogenic.

	GENERIC DRUG	LOW RISK OF TERATOGENICITY	POTENTIALLY TERATOGENIC	NOT SURE
1	Alprazolam			
2	Amitriptyline			
3	Atorvastatin			
4	Candesartan			
5	Carbamazepine			
6	Cetirizine			
7	Ciprofloxacin			
8	Clopidogrel			
9	Doxycycline			
10	Enalapril			
11	Escitalopram			
12	Esomeprazole			
13	Ezetimibe			
14	Fluticasone/Salmeterol			
15	Lansoprazole			
16	Levofloxacin			
17	Levothyroxine			
18	Diazepam			
19	Losartan			
20	Metoprolol			
21	Montelukast			
22	Pantoprazole			
23	Phenytoin			
24	Sertraline			
25	Sildenafil			
26	Venlafaxine			
27	Amlodipine			
28	Warfarin			

For Questions 1-25 please mark an X in the one box that best describes your answer, unless otherwise instructed.

1. Do you care for reproductive aged women (15-50yrs)?

☐ YES. Continue to the next question

☐ NO (Thank you for your time. You may stop now)

2. KNOWLEDGE ON TERATOGENIC MEDICATIONS COMMONLY IN RHEUMATIC DISEASES

(a) Pick three teratogenic rheumatology medications:

- Prednisone
- Methotrexate
- Cyclophosphamide
- Leflunomide
- Cyclosporine
- Hydroxychloroquine
- Azathioprine
- Mycophenolate
- Adalimumab

(b)Rank the teratogenic effect from the most to least likely.

- Methotrexate
- Cyclophosphamide
- Mycophenolate

(c)In women with Lupus or Aps, which is true about hormonal IUD.

A) An IUD should not be placed when a woman is immunosuppressed.

B) There are no restrictions on the use of IUDs.

C) A hormonal IUD should be avoided due to thrombosis risk

D) The IUD may be rejected by woman's autoimmune disease

3. Knowledge on contraception.

(a) What is the likelihood that a woman will get pregnant over 5years if she uses……..for birth control?

Condom ……..%

Depo-Provera ……..%

Mirena IUD ……..%

(b) Emergency contraception contains?

(i) Estrogen

(ii) Progesterone

(iii) Estrogen and progesterone

(c)TRUE/FALSE: Emergency contraception can cause abortion?

TRUE…… ☐

FALSE…… ☐

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

4. In your estimation, in the past 12 months what percent of your patient population was made up of women of reproductive age? (Please circle the corresponding percent)

5. In the past 12 months have you ever cared for a woman of reproductive age who was taking potentially teratogenic medications (prescribed by you or another provider)?

☐ 1 Yes ☐ 9 Don't Know/Not Applicable

☐ 0 No

6.

Do you ever	YES	NO	DON'T KNOW
a) Care for women during pregnancy (e.g., on - going treatment for chronic condition)?	1 ☐	0 ☐	9 ☐
b) Counsel patients about contraception your practice?	1 ☐	0 ☐	9 ☐
c) Prescribe contraception in your practice?	1 ☐	0 ☐	9 ☐
d) Recommended using emergency contraception?	1 ☐	0 ☐	9 ☐

7. Have you ever referred a patient for any of the following: (Please mark all that apply?)

- ☐ 1 Contraception counseling
- ☐ 2 Contraceptive maintenance/surveillance
- ☐ 3 Contraceptive prescription
- ☐ 4. Emergency/postcoital contraception

9Don't know/Not Applicable

8. Have you ever refrained from, changed, or discontinued a prescription for a potentially teratogenic medication for women of reproductive age because of concern for possible fetal exposures?

(Please mark all that apply)

- ☐ 1 Refrained
- ☐ 2 Changed
- ☐ 3 Discontinued
- ☐ 4 None of the above
- 9 Don't Know

9. What references do you use to determine whether a medication is listed as potentially teratogenic? (Please mark all that apply)

- ☐ 1 Textbooks/handbooks
- ☐ 2 Physicians' Desk Reference (PDR)
- ☐ 3 Handheld computer
- ☐ 4 Website or other online resource
- ☐ 5 Consult another physician
- ☐ 6 Medical journal articles
- ☐ 7 Epocrates®
- ☐ 8 LexiDrug™
- ☐ 9 The Medical Letter®
- ☐ 10 Clinical Pharmacology™ website
- ☐ 11 UpToDate®
- ☐ 12 Monthly Prescribing Reference® (MPR)
- ☐ 13Other: (Please specify) _____

10. Do you routinely obtain or update each patient's current medication regimen for during each visit?

☐ 1 Yes ☐ 9 Don't Know/Not Applicable
☐ 0 No

11. Who in your office obtains patients' current medication list and/or history of medication use? (Please mark all that apply)

☐ 1 Physician ☐ 2 Secretary
☐ 3 Nurse ☐ 4 Patient self-report (intake questionnaire)
☐ 5 clinical officer 6Other: (Please specify) _____

12. How many patients do you typically see in 1 hour?

0 Less than 1 per hour

1 1-2 per hour

2 3-4 per hour

3 5-6 per hour

4. More than 6 per hour

13. When prescribing or counseling patients about potential adverse effects of medications, which of the following methods/items do you believe are the most important?

(Please rank from 1-3 the **top 3** methods in your opinion.)

13Q1_____Patient counseling performed by the physician
13Q1_____Patient counseling performed by a nurse or other healthcare provider
13Q1_____Preprinted material given to the patient at the time of her office visit
13Q1_____Package insert included in prescription.
13Q1_____Information provided by the pharmacist
13Q1_____Referral to reference books
13Q1_____Referral to websites

14. Please indicate your perception of *typical failure rate* for each of the following methods of birth control used over a 12-month period.

(Mark one (1) box per line)	Mark the % of women who will become pregnant in 1 year of typical use					Not Sure
Natural Family Planning	<1%	1-5%	6-10%	10-20%	>20%	N S
Timing/Rhythm methods	1	2	3	4	5	9
Withdrawal	1	2	3	4	5	9
Barrier Methods						
Male Condoms	1	2	3	4	5	9
Female Condoms	1	2	3	4	5	9
Diaphragm/Cervical Cap	1	2	3	4	5	9
Spermicides (Foam, Jelly, Lubricants)	1	2	3	4	5	9
Hormonal Methods						
Hormonal Contraception (Combined or Progestin only Pills)	1	2	3	4	5	9
Injectable hormonal contraceptives (i.e. Depo-Provera®)	1	2	3	4	5	9
Implantable subdermal contraceptive (i.e. Implanon□)	1	2	3	4	5	9
Other						
Intrauterine Contraceptives (i.e. Mirena®)	1	2	3	4	5	9
Sterilization (i.e., tubal ligation)	1	2	3	4	5	9

15. Please indicate whether you agree with the following statements:

(Mark one (1) box per line)	Strongly disagree	Disagree	Agree	Strongly Agree
It is the responsibility of primary care physicians to provide family planning and contraceptive services	1	2	3	4
Medical school adequately prepared me to counsel about and prescribe contraceptives	1	2	3	4
Residency training adequately prepared me to counsel about and prescribe contraceptives	1	2	3	4
Medical school adequately prepared me to counsel patients about potentially teratogenic medications	1	2	3	4
Residency training adequately prepared me to counsel patients about potentially teratogenic medications	1	2	3	4
I would benefit from CME on counseling patients about potentially teratogenic medications	1	2	3	4
I would benefit from CME on counseling patients about contraception	1	2	3	4
I feel I have access to adequate resources/references to help me care for women who need contraception while on potentially teratogenic medications	1	2	3	4

16. For women who are taking potentially teratogenic medications, please indicate how likely you would be to *prescribe* or whether you *refer* for the following contraceptive methods.

(Mark one (1) box per line)	Prescribe				Refer
	Never	Seldom	Usually	Always	
Natural Family Planning (Timing/Rhythm method, withdrawal)	1	2	3	4	Refer
Barrier Methods (i.e., male/female condoms, diaphragm)	1	2	3	4	Refer
Spermicides	1	2	3	4	Refer
Oral Contraceptive Pills (combined and progestin-only)	1	2	3	4	Refer
Vaginal Ring Contraceptive (NuvaRing®)	1	2	3	4	Refer
Birth Control Patch (Ortho Evra®)	1	2	3	4	Refer
Injectable hormonal contraceptives (i.e., Depo-Provera®)	1	2	3	4	Refer
Implantable hormonal contraceptives (i.e. Implanon□)	1	2	3	4	Refer
Intrauterine Contraceptives (i.e., Mirena®, Paragard®)	1	2	3	4	Refer
Sterilization (i.e., tubal ligation, vasectomy, Essure®)	1	2	3	4	Refer

17. When you refer women of reproductive age taking potentially teratogenic medications to another physician/provider for contraceptive counseling and management, to what kind of provider are they referred?

☐ 1 Ob/Gyn

☐ 2 Nurse Midwife

☐ 3 A different Internal Medicine/Family Medicine Physician

☐ 4 Do not refer

5 Other: (Please specify) _____

18. Please indicate how *limiting* you feel each of the following are in your ability to provide contraceptive counseling to women who are taking potentially teratogenic medications.

(Mark one (1) box per line)	Not at all limiting	Not too limiting	Somewhat limiting	Very limiting
Time constraints	1	2	3	4
Inability to bill for counseling time	1	2	3	4
Lack of knowledge about contraceptive methods	1	2	3	4
Lack of knowledge about potentially teratogenic medications	1	2	3	4
expectation that another provider (i.e. Ob/Gyn) is involved	1	2	3	4
Lack of communication with other physicians caring for same patient (i.e. who may prescribe potentially teratogenic medications)	1	2	3	4
Inability to share medical records with other physicians caring for same patient	1	2	3	4

19. Please indicate whether you agree or disagree with each of the following statements regarding contraceptive management for women of reproductive age for whom you have prescribed potentially teratogenic medication:

(Mark one (1) box per line)	Strongly disagree	Disagree	Agree	Strongly Agree
I am interested in obtaining more information on these subjects.	1	2	3	4

A laminated pocket reference of potentially teratogenic medications sorted by therapeutic class would be useful.	1 2 3 4
An alert in the electronic medical record (similar to an allergy alert) about a need to discuss/prescribe contraception when writing a prescription for a potentially teratogenic medication would be useful.	1 2 3 4
All potentially teratogenic medications should have a contraceptive compliance program.	1 2 3 4
I would use a referral service for contraceptive counseling for women with underlying medical conditions or taking potentially teratogenic medications if it was available.	1 2 3 4
I would use a telephone consultation service for questions regarding providing contraception to women with underlying medical conditions if it was available.	1 2 3 4
It would be useful to have information about potential teratogens that is designed for patients to understand.	1 2 3 4
A pregnancy risk classification system that is evidence-based would be useful.	1 2 3 4
I feel it is important to have medication reference tools that are handheld.	1 2 3 4
I would benefit from hands-on training in order to use currently available resources.	1 2 3 4

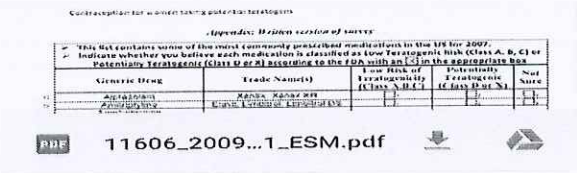
20. Please use the space on this page to describe other limitations you feel exist in being able to successfully provide contraception to women on potentially teratogenic medications. You may also wish to provide other suggestions that you believe would be helpful in your practice.

Thank you for participating.

Appendix 3: Email correspondence.

Permission for use of the questionnaire for my study was sought and granted by Dr. David Eisenberg through email at eisenbergd@wustl.edu

Thank you so much for your response.
When I looked at the study I was able to get the questionnaire from the published site.
The questionnaire is attached to this email.
my request was for your permission to use it in my study.thanks.



Contraception for women taking potentially teratogenic

Appendix: Written version of survey

- This list contains some of the most commonly prescribed medications in the US for 2007.
- Indicate whether you believe each medication is classified as Low Teratogenic Risk (Class A, B, C) or Potentially Teratogenic (Class D or X) according to the FDA with an [✓] in the appropriate box

	Generic Drug	Trade Name(s)	Low Risk of Teratogenicity (Class A,B,C)	Potentially Teratogenic (Class D or X)	Not Sure
1)	Alprazolam	Xanax, Xanax XR	[ ]	[ ]	[ ]
2)	Amitriptyline	Elavil, Endep, Limbitrol, Etrafon, Triavil	[ ]	[ ]	[ ]

PDF 11606_2009...1_ESM.pdf

Eisenberg, David 7/23/2020
to me

I forgot that we provided the survey tool as an appendix to the JGIM publication. I'm glad you found it. You have permission to use this in your study.

Good luck,

DLE

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UON INTERNAL RESIDENTS' KNOWLEDGE, PRACTICES, AND BARRIERS IN CONTRACEPTION PROVISION AMONG WOMEN ON POTENTIALLY TERATOGENIC MEDICATIONS. by Dr. Fredrick Mumo Mwaka,

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Approval of the lead Supervisor and Chairman of the Department

Prof.George O.Oyoo

Associate professor, Department of Clinical Medicine and Therapeutics

Consultant Physician and Rheumatologist

University of Nairobi

Signature ..... Date 15/08/2023

Prof.Erastus Amayo

Chairman

Department of Clinical Medicine and Therapeutics

University of Nairobi

Signature ..... Date 17/08/2023

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