Incidence, Risk Factors and Awareness of Pregnant Women Regarding Fetal Congenital Anomalies

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Abstract

Background: Congenital abnormalities are a public health problem and the major cause of morbidity and mortality in early life in developing and developed nations. **Aim of the study:** Was to evaluate incidence, risk factors and awareness of pregnant women regarding fetal congenital anomalies. **Subjects and Methods; Research design:** A descriptive design was used to carry out this study. **Setting**: The study was conducted at outpatient clinic fetal medicine and ultrasound unit at Zagazig university hospitals in Sharkia Governorate, Egypt. **Subjects:** Purposive sample of all pregnant women who attended the selected setting. **Tools of data collection:** Three tools were used for data collection; a structured interviewing questionnaire, risk factors of fetal congenital anomalies assessment questionnaire and pregnant women awareness questionnaire regarding fetal congenital anomalies. **Results:** The incidence of fetal congenital anomalies among the studied pregnant women was 7.3%. Consanguinity, exposing to x-rays, pesticides air pollution and viral infection, untaken of folic acid and take drugs during pregnancy, having diabetes and polyhydramnios increased the odds of developing fetal congenital anomalies. More than three quarters of the studied pregnant women with fetal with congenital anomalies had unsatisfactory level of total awareness regarding fetal congenital anomalies. **Conclusion:** There was highly significant negative correlation between total women's awareness and exposure to x-rays, pesticides and heavy materials as lead and mercury. Also, there was a statistically negative correlation between total women' awareness and eating uncooked meat and malnutrition. **Recommendations:** Employing educational nursing programs can help in raising women's awareness and preventive measures about CAs. Premarital testing and preconception counseling particularly for consanguineous married couples can be extremely helpful in educating about potential dangers and assisting them in making well-informed decisions on family planning.

Key words: Incidence, Risk Factors, Awareness, Pregnant Women, Congenital Anomalies.

Introduction:

Worldwide, congenital anomalies (CAs) caused as a significant public health concern as it led to increased healthcare expenses, long-term impairments, and neonatal and infant death. In addition, it has long-term negative impact on individual's physical, mental, and social well-being as well as their families. Congenital anomalies (CAs) are defects in structure, cognition, or function that arise during pregnancy and can be identified prior to, during, or following delivery [(1)].

Fetal congenital abnormalities vary widely in incidence between countries and even within the same nation's regions. The differences in rates might be attributed to economic, social, racial, and ecological influences. Worldwide, 2.0% - 4.0% percent of infants are born with CAs, and the incidence of it is higher in Arab nations than in non-Arab nations [(2)]. Globally, CAs was responsible for over 265,000

deaths, or 7.0% of all neonatal deaths. Even while other regions, including the WHO European Region, have lower overall mortality rates, up to 25.0% of infant deaths are related to CAs [(3)]. In 2009, there were 20 cases of CAs for every 1000 live births in Egypt [(4)].

Recently, in Zagazig, Egypt; two important studies conducted about the incidence of CAs. The incidence of congenital anomalies was 2.47% among neonates in 2022 [(5)], while the prevalence of congenital fetal malformations (CFMF) in 2021 was 3.6 % [(6)]. However, it is uncertain what exactly causes CAs, a variety of factors contributes to congenital anomalies, such as genetics, environmental pollutants, nutritional, socioeconomic, demographic factors as old age of the mother, conditions affecting the mother like diabetes, infection, and exposure to drugs (such as alcohol and tobacco) for therapeutic as well as recreational reasons [(7)].

Based on the affected bodily system, the International Classification of Diseases divided CAs into major and mild abnormalities. Major anomalies impact the infant's life health and ability to function physically or socially, while minor anomalies have minimal or no effect on a person's health or ability to function over the short-or long-term. They can also be categorized into three severity groups: Lethal, severe, and minor anomalies. Major anomalies are abnormalities that are both severe and lethal [(8)].

The most prevalent type of congenital abnormalities is nervous system anomalies, which include meningoencephalocele, hydro-cephalus, spinal bifida, anencephaly, and encephalocele. Abnormalities of the gastrointestinal system including omphalocele, gastroschisis, and imperforate anus, were the next most common type. These were followed by musculoskeletal system anomalies, including club foot, cleft lip and/or palate, and genitourinary system anomalies, including hypospadias and ambiguous genitalia [(7)].

In the past, amniocentesis and chorionic villi sampling were the main methods used to diagnose congenital anomalies. Biochemical markers and karyotyping are two further screening techniques that may be utilized to find CAs. Because ultrasound is a dependable, cost-effective, and highly sensitive screening method for congenital anomalies, it is the recommended non-invasive screening approach. It is done while the pregnancy is between weeks 18 and 23. The most common method for prenatal screening has been taken over by two-dimensional ultrasonography (2D-US). Conventional (2D) US does not provide multiplanar view, tomographic view, surface view, transparent view, or volume contrast imaging. These features are exclusive to 3D/4D US [(9)].

Fetal abnormalities may be safely and reliably detected using cell-free fetal DNA (cffDNA) analysis, which has become a valuable tool for prenatal diagnosis. The primary function of cffDNA analysis, a noninvasive prenatal diagnostic technique, is to screen for chromosomal or monogenic diseases in the developing baby. Starting in the fourth week of pregnancy, the test can be used to identify fetal DNA in the mother's blood [(10)].

Treatment options include minimally invasive surgical procedures like fetoscopy or open surgery hysterotomy, based on the kind of anomaly found and the expertise of the team. In some cases of congenital anomalies, including as severe congenital diaphragmatic hernias (CDHs), gigantic sacrococcygeal teratomas, and massive congenital cystic adenomatoid malformations (CCAMs) with hydrops symptoms, fetal surgical intervention may be an acceptable option [(10)]. There was a substantial correlation seen between CAs and high rates of caesarean births, low birth weight, admission to

the neonatal intensive care unit (NICU), a pgar scores less than 7 at 1 and 5 minutes, preterm, and in-hospital mortality [(8)].

A nurse should advise women who suffer from conditions like diabetes mellitus to get pregnancy and prepregnancy care. Additionally, while prescribing medicine during pregnancy, medical providers have to use rigorous judgment. Before writing a prescription, they should determine if the medication is potentially teratogenic, and each health care office should have access to guidelines. Moreover, preconception care, vaccines, and getting adequate folic acid prior to and throughout the initial phases of gestation are all mandated by governments in low-resource countries [(11)].

It demonstrated that having enough knowledge can avoid genetic diseases and congenital anomalies, as well as the negative social, medical, and economic effects of birth defects. It can also enhance the possibility that both the mother and the child will have a higher quality of life. Premarital genotyping screening, eating a balanced diet, remaining normal weight, ensuring getting enough vitamins and minerals in diet, especially folic acid, abstaining from tobacco use, avoiding infections linked to CAs, and limiting exposure to radiation, heavy metals, pesticides, and other potentially harmful substances in the environment, iodination of food items, rubella vaccination, and early detection, identification, and management of any underlying medical issues prior to conception are interventions that can help prevent congenital anomalies. The nurse should counsel all pregnant women to be aware of these interventions and to understand when and how to visit a healthcare facility for medical care. Also, CAs treated either medical or surgical whether intrauterine or extra uterine [(12)].

Planning, implementing, and evaluating preventive measures and treatment services, as well as documenting the need for prevention to support the development of public health policies, all depend on early identification of risk factors, accurate estimation of CAs in a specific population, and raising awareness [(8)].

Educating mothers and helping them cope with the emotional and physical challenges brought on by congenital defects are important roles played by nurses. They also encourage mothers to work together to build strong bonds with their children. Because they must advise mothers to consume enough folic acid prior to and during the initial stages of pregnancy, nurses are crucial in the preconception care process [(13)].

Significance of the study:

Fetal congenital abnormalities (CAs) significantly impair the quality of life for the child and his family and place a financial strain on the family, the community, and the healthcare system. The fifth most common cause of illness and death in children globally is CAs [(14)]. 8.1 million babies are affected by CAs worldwide, and these problems result in the deaths of about 3.3 million babies annually. Furthermore, CAs responsible for the disability of nearly 3.2 million children globally. In low- or middle-income countries (LMICs), nine out of ten newborns born with serious congenital abnormalities [(15)].

For the purpose of counseling, intervention, and potential fetal treatment, early prenatal detection and diagnosis of CAs is essential. A new approach is required to lower congenital abnormalities. Finding risk factors is vital for reducing the number of newborn deaths and disabilities brought on by congenital defects. The nurse plays a vital role in detecting fetal congenital anomalies, identifying risk factors that developing them and improving women awareness to avoid perinatal morbidities and mortalities. Few studies have been conducted on predisposing factors and awareness of CAs in Zagazig city, therefore this

research was carried out to evaluate incidence, risk factors and awareness of pregnant women regarding fetal congenital anomalies.

Aim of the study:

Was to evaluate incidence, risk factors and awareness of pregnant women regarding fetal congenital anomalies

This aim will be accomplished by achieving the objectives that are listed below:

- Estimate the incidence of fetal congenital anomalies among pregnant women.
- Identify the risk factors of fetal congenital anomalies among pregnant women.
- Assess the awareness level of the pregnant women regarding fetal congenital anomalies.

Research Questions:

1. What is the incidence of fetal congenital anomalies among pregnant women?
2. What are the risk factors of fetal congenital anomalies among pregnant women?
3. What is the awareness level of the pregnant women regarding fetal congenital anomalies?

Subjects and Method:

Research Design:

This research was carried out using a descriptive design.

Setting:

This research was conducted in outpatient clinics at fetal medicine and ultrasound unit at Zagazig University hospitals in the Sharkia Governorate, Egypt. This setting was chosen because it is the main teaching hospital in Zagazig city where the flow rates of the pregnant women who get prenatal care increase. The fetal medicine and ultrasound unit is found in the second floor. This unit contains a tiny room for assistant nurses and bathroom. Also there are two rooms fitted with everything needed for exams. This unit is available daily between 9:00 am and 1:00 pm and is located next to obstetrics and gynecological clinic.

Study Subjects:

Pregnant women who met the following requirements were selected by purposive sample to become part of the research sample:

- **Inclusion criteria:**

All Pregnant women in (second and third trimester) attending antenatal clinic and agree to participate in the study.

- **Exclusion criteria:**
  1. Pregnant women who refused to participate in the study.
  2. Pregnant women in first trimester (below or equal to 13 weeks of pregnancy).
  3. Laboring women or who admitted immediately to emergency room.

Sampling size and technique:

All pregnant women who came to the previously mentioned setting and met the inclusion requirements for six months from July 1 to December 31, 2023 participated in this study. They were 574.

Tools of data collection:

The researchers used the following three tools to achieve the current study's aim:

Tool I: A structured interviewing questionnaire: After reviewing the relevant past and present literature, the researchers created it in simple Arabic language to collect the data needed to achieve the study's objective. **It divided into the following four main parts:**

- **Part I: Demographic data:** Eight questions were included in this part to assess the study's pregnant women's demographic information, including age, residence, level of education, work condition, family income, consanguinity…etc.
- **Part II: Previous and current Obstetric history:** This part

involved 19 questions as current gestational age, gravidity, parity, history of abortion, history of stillbirths, antenatal follow up for current pregnancy, number of antenatal visits ... etc.

- **Part III: Family history (one question)** as Family history of congenital anomalies.
- **Part IV: Current medical history:** This part included 13 questions about type of maternal disease that found during the current pregnancy that may be the risk factor for congenital anomalies such as diabetes, hypertension, toxoplasmosis … etc.

Tool II: Risk factors of fetal congenital anomalies assessment questionnaire: It was created by the researchers in simple Arabic language after being adopted from many of literatures [5, 16]. It included 24 questions about main following six parts:

- **Part I: Exposure to physical agents:** The researchers asked the pregnant women about three risk factors as passive smoking, x-rays and hyperthermia.
- **Part II: Exposure to chemical agents:** It included 4 questions as drinking alcohol, exposure to toxic chemicals, exposure to pesticides and heavy materials.
- **Part III: Exposure to environmental agents:** It included 4 questions as living near to a hazardous waste site, exposure to air pollution, exposure to radiation and poor water quality.
- **Part IV: Exposure to nutritional agents:** The researcher asked the pregnant women 7 questions nutrition as eating fast food, eating uncooked meat, excessive amount of vitamin A, untaken of folic acid, unclean vegetables and fruits, malnutrition and drinking caffeine more than 400mg daily.
- **Part V: Exposure to drugs:** The researcher asked the pregnant women 4 questions about drugs that may take during current pregnancy as type of drug, dose…etc.
- **Part VI: Exposure to infectious agents:** It included 2 questions about infectious agent's exposure as viral infection as measles or cytomegalovirus, viral hepatitis as Hepatitis B, Hepatitis C.

Tool III: Pregnant women awareness questionnaire regarding fetal congenital anomalies: It was created by the researchers following a comprehensive review [12, 13, 17, 18]. It included 12 questions related to fetal congenital anomalies as background about fetal congenital anomalies, source of background, definition, types, risk factors, prevention, diagnosis, complications…etc.

Scoring system for tool III:

There were twelve questions on the questionnaire, and a total of twenty-four grades were awarded. A completely correct response received two points, an incomplete correct response received one point, and the wrong answer or don't know received zero point. Question 32 asked about (what is the source of background about fetal congenital anomalies) didn't scored as its response don't depend on correct or incorrect response. A percentage score was generated by adding these scores together. It was divided into two groups:

- **Satisfactory awareness:** If the score ≥ 70.0%.
- **Unsatisfactory awareness:** If score <70.0%.

Content validity and reliability:

The three tools and brochure (instructional nursing guidelines) were assessed for thoroughness by a panel of three expert professors from Zagazig University's faculty of nursing (two professors of obstetrics and gynecological nursing, one professor

of pediatric nursing), as well as one specialist from the faculty of medicine who specialized in pediatric and one in obstetrics and gynecologic medicine. The contributions' appropriateness and readability were assessed as well. The group of experts evaluated the validity of the tools and pediatric in terms of both their contents and appearance. A few sentences and a few elements were changed, together with other minor but required modifications. The reliability of the study tools is evaluated using Cronbach's alpha. Its values were 0.739 and 0.878 for tool II and tool III respectively.

Pilot study:

It was conducted over a period of eighteen days (10.0%). pilot study was about 57 pregnant women. The purpose of the test was to evaluate the practicality and clarity of the study tools, identify any problems and barriers that may arise for the researcher and delay data collection, and determine how long data collection would take. The necessary changes were made by adding or removing certain questions, altering the type of some questions, and making other changes to make the research more simple and accessible in light of the pilot study's findings. The pregnant participants in the pilot study were excluded from the study.

Field work:

The data collection period was six months, from July 1st to December 31st, 2023. The study tools were created once formal approval was obtained, and the pilot study was conducted and analyzed thereafter. To accomplish the goal of the study, the following phases were selected and finished:

1. The Preparatory phase:

In order to obtain a comprehensive theoretical realize of all elements of the problem, the researcher examined the recent and historical literature that was relevant to the study topic during this phase. For this, the researcher reviewed books, journals, textbooks, web sources from scientific publications, newspapers, and magazines. Subsequently, the development of study tool was completed. It was in Arabic language and covers all information related to risk factors and awareness about fetal congenital anomalies. Also, the researcher prepared brochure (instructional nursing guidelines) to help the pregnant women to be aware about fetal congenital anomalies.

2. Interviewing phase:

When the pregnant women who met the criteria for becoming eligible for the study arrived the previously mentioned study setting, the researcher introduced herself to them. The researcher interviewed each pregnant woman individually in waiting area at outpatient clinics and informed her about the study's objectives. After that, they offered their verbal agreement to have their cooperation. After the women's completed their checkup and follow up visits at the prenatal clinic, they were met on the hot three days weekly (Saturday, Monday, and Wednesday) by the researcher where these days were defined for pregnant women antenatal care from 9:00 am to 1:00 pm during the morning shift. Four to eight pregnant women were interviewed on average each day.

3. Assessment phase:

Each pregnant participant in the research was requested to complete the study tools after explaining the goals of the study. They were given individually to each woman. The researcher used tool I to assess pregnant women's demographic data, previous and current obstetric history, family history and also assess current medical condition that describe maternal diseases which may lead to fetal congenital anomalies. This took time range (10-15) minutes. Also, the researcher assessed the risk factors of fetal congenital anomalies among pregnant women through utilization of tool II by asking the pregnant women about all agents she exposed during pregnancy that may affect her

pregnancy. Also, this took time range from 10 to 15 minutes. Pregnant women awareness regarding fetal congenital anomalies as definition, types, risk factors, prevention, diagnosis, complications was assessed by the researcher through utilization of tool III in 15 minutes. Each interview lasted 45 minutes in total, which the researcher filled out. Up to the end of the study period, repeated the previous steps with every woman.

4. Planning and implementation phase:

After the researcher assessed risk factors and pregnant women's awareness regarding fetal congenital anomalies, the researcher answered all questions regarding fetal congenital anomalies to each pregnant woman individually. The researcher counsel and support each pregnant woman whose 4D ultrasound found fetal congenital anomalies by continues contact with them through telephone and social media as a method of communications to ensure women compliance. Any explanation or any questions they needed during the six months from the first interview were answered by the researcher. All pregnant women in the study took a brochure) instructional nursing guidelines) from the researcher. It contains all information that the pregnant women need to know about fetal congenital anomalies.

Administrative and Ethical considerations:

The appropriate authorities for the research setting received formal permission to collect data through a formal letter from Zagazig University's Faculty of Nursing. The research has been approved by Zagazig University, faculty of nursing Ethical committee by ethical code (**M.D.Zu.Nu.R/186/13/6/2023**). All ethical issues were taken into account throughout the entire study; the researcher upheld the subjects' confidentiality and anonymity. Before pregnant women participation in the study, the pregnant women were greeted by the researcher, who also briefly explained the nature and objectives of the study to each of them. After the oral agreement process, the pregnant women were voluntarily recruited. Additionally, pregnant women were aware that all information acquired for the study was confidential and would only be utilized for research. They also had the option to leave the study at any time.

Statistical analysis:

Coding and data input were the two phases of quality control used in the study's data entry process. The collected data was statistically examined, arranged, and shown as needed in tables, figures, numbers, and diagrams. Appropriate statistical tests were employed to determine the significance of the results obtained using the statistical program for social science (SPSS version 23). The current study's statistical presentation and analysis made use of the mean, standard deviation, correlation, and Chi-square. Finally, a p-value of less than 0.05 used to determine statistical significance.

The following standards for significance were accepted:

- $P \leq 0.01$ for highly statistically significant (HS).
- $P \leq 0.05$ for statistically significant (S).
- $P > 0.05$, there is no statistical significance.

Limitation of the study:

Oral agreement was obtained from the pregnant women because it was difficult to obtain written consent from them prior to their involvement in the study because of their lack of awareness and fear of filling any paperwork.

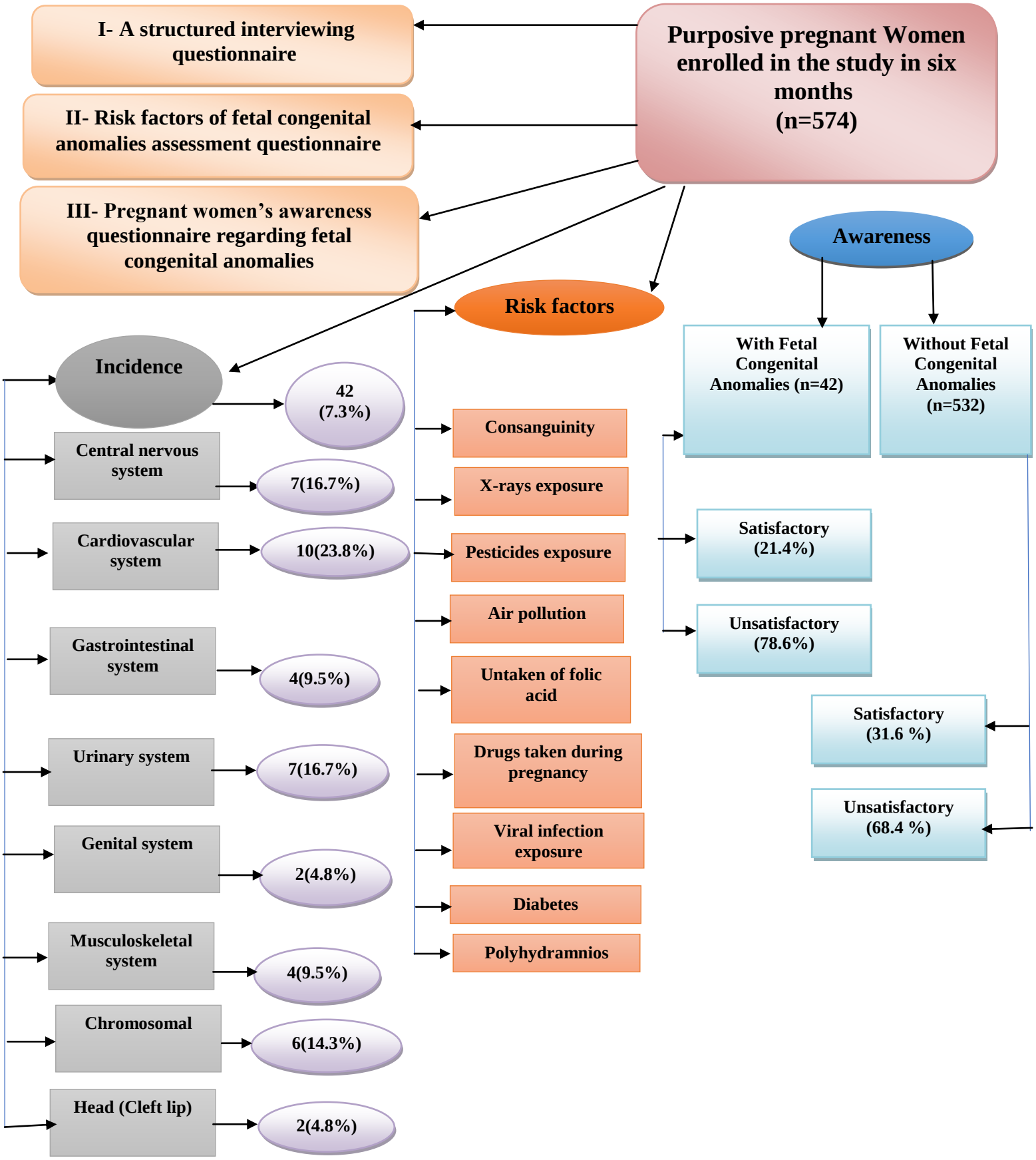

Figure (1): Analytical Flowchart of the study

Results:

Table (1) illustrates that half of the studied pregnant women with fetal congenital anomalies (50.0%) their age was from 30 - <40 years old compared to only (27.6%) of the studied pregnant women without fetal congenital anomalies. For residence, (81.0%) of the studied pregnant women with fetal congenital anomalies was residing at rural area compared to (61.1%) of the studied pregnant women without fetal congenital anomalies. Regarding educational level, less than half of the studied pregnant women with fetal congenital anomalies (47.6%) were illiterate compared to only (15.8%) of that of the studied pregnant women without fetal congenital anomalies. More than three quarters of the studied pregnant women with fetal congenital anomalies (76.2%) were housewife compared to (81.6%) of the studied pregnant women without fetal congenital anomalies. Also, more than half of the studied pregnant women with fetal congenital anomalies (54.8% and 57.1%) had sufficient family income and had consanguinity, respectively compared to that of the studied pregnant women without fetal congenital anomalies (62.4% and 44.7%) respectively.

Figure (2) clarifies, less than half of the studied women with CAs (47.6%) were obese compared to only (34.2%) of that in the studied pregnant women without fetal congenital anomalies.

Table (2) demonstrates that, the mean ± SD of women's gestational age with fetal congenital anomalies was 28.21±6.00 compared to 27.42±6.43 for women's gestational age without fetal congenital anomalies. Also, (47.6%) of the studied pregnant women with fetal congenital anomalies had 5- ≥ 6 previous pregnancies compare to (14.5%) for pregnant women without fetal congenital anomalies. Also, (61.9%) of the studied pregnant women with fetal congenital anomalies had history of abortion compared to (28.9%) of the studied women without fetal congenital anomalies. Regarding antenatal follow up, most of the studied pregnant women with fetal congenital anomalies (88.1%) maintained antenatal follow up compared to (97.4%) of that of the studied pregnant women without fetal congenital anomalies. Also, (73.8%) of the studied pregnant women with fetal congenital anomalies don't have history of delivery of child with congenital anomalies compared to (94.0%) of the studied women without fetal congenital anomalies.

Table (3) demonstrates that, less than three quarters of the studied pregnant women with CAs (73.8%) have disease during current pregnancy compared to only (42.1%) in the studied pregnant women without CAs. More than half of the studied pregnant women with fetal congenital anomalies have hypertension with pregnancy and severe anemia (58.1% and 45.2%) compared to only (34.8% and 12.5%) respectively of that in the studied pregnant women without fetal congenital anomalies. Diabetes was found to affect (41.9%) of the studied pregnant women with fetal congenital anomalies compared to (27.2%) which effect of that in the studied pregnant women without fetal congenital anomalies.

Table (4) describes the incidence of CAs among the studied pregnant women. It shows that among total number of studied pregnant women; 7.3% per 100 of them had fetal congenital anomalies.

It's obvious from **Figure (3)** that the most common types of fetal congenital anomalies in the studied pregnant women with fetal congenital anomalies was related to cardiovascular system (CVS) (23.8%) followed by Central nervous system (CNS) and urinary system (16.7%), Chromosomal (14.3%), Gastrointestinal system and Musculoskeletal system (9.5%) and head (7.1%). Also, the vast minority of the studied pregnant women (4.8%)

stated genital system congenital anomalies.

Table (5) reveals that, for exposure to physical agents; all and less than one quarter of the studied pregnant women with fetal congenital anomalies (100.0% & 23.8%) exposed to passive smoking and x-ray, respectively compared to (94.0% & 2.6%) of the studied pregnant women without fetal congenital anomalies. Regarding exposure to chemical agents, less than one quarter (23.8%) of the studied pregnant women with fetal congenital anomalies exposed to pesticides compared to (0.0%) of the studied pregnant women without fetal congenital anomalies. In relation to exposure to environmental agents, more than quarter and two fifths of them (28.6% & 40.5%) of the studied pregnant women with fetal congenital anomalies exposed to air pollution and poor water quality, respectively compared to (1.3% &10.5%) of the studied pregnant women without fetal congenital anomalies. Regarding exposure to nutritional agents, the majority and half of the studied pregnant women with fetal congenital anomalies (83.3% & 50.0%) were overweight and drinking caffeine more than 400 gm daily, respectively compared to (63.2% & 18.8%) of the studied pregnant women without fetal congenital anomalies. In relation to exposure to drugs, two thirds of the studied pregnant women with fetal congenital anomalies (66.7%) took drugs during pregnancy compared to (43.4%) of that of the studied pregnant women without fetal congenital anomalies.

Bivariate analysis of the risk factors in **Table (6)** indicated the independent variables that were strongly associated with fetal congenital anomalies among the studied pregnant women. Consanguinity and exposing to x-rays increased the pregnant women odds of developing fetal congenital anomalies by 9.321 times and 11.563 respectively. Exposing to pesticides and air pollution also increased the odds of developing fetal congenital anomalies by 17.625 times and 30.000 times, respectively. Moreover, untaken of folic acid and take drugs during pregnancy also increased the odds of developing fetal congenital anomalies by 10.606 times and 2.606 times, respectively. Furthermore, exposure to viral infection, having diabetes and polyhydramnios also increased the odds of developing fetal congenital anomalies by 13.976 times, 3.461 times and 4.022 times, respectively.

Table (7) illustrates that, (81.0% & 71.4%) of the studied women with fetal congenital anomalies have complete correct answer regarding background about fetal congenital anomalies and types of fetal congenital anomalies compared to (78.9% & 64.5%) respectively of the studied women without fetal congenital anomalies. While, (73.8% & 92.9%) of the studied women with fetal congenital anomalies don't know the diagnosis of fetal congenital anomalies and some types of fetal congenital anomalies can be treated intrauterine compared (81.6% & 40.8%) respectively of the studied women without fetal congenital anomalies. Also, (61.9% & 64.3%) of the studied women with fetal congenital anomalies don't know severe structural anomalies often need surgery shortly after birth and congenital anomalies can be treated medically after birth to a certain extent compared to (57.9% & 51.3%) respectively of the studied women without fetal congenital anomalies. Additionally, (57.1%) of the studied women with fetal congenital anomalies don't know that pregnancy with congenital anomalies need termination compared to (55.3%) of the studied women without fetal congenital anomalies.

Figure (4) shows that, more than three quarters (78.6%) of the studied pregnant women with fetal congenital anomalies had unsatisfactory level of total awareness regarding fetal congenital anomalies compared to

(68.4%) of the studied pregnant women without fetal congenital anomalies.

Table (8) reveals that, there was highly significant negative correlation between total women' awareness and exposure to x-rays (r= -0.525-), pesticides (r= -0.525-) and heavy materials as lead and mercury (r= -0.424-) at p <0.01. Also, there was a statistically negative correlation between total women' awareness and eating uncooked meat (r= -0.307-) and malnutrition (Overweight) (r= -0.389-) at p <0.05.

Discussion:

Congenital abnormalities (CAs) recognized as a probable global public health concern. They are linked to increased healthcare expenses, spontaneous abortion, stillbirth, long-term disabilities, and neonatal and infant death [(1)]. Eight million children with CAs are born each year in the the world; 3.3 million of them die before becoming five years old, and 3.2 million of the survivors may have physical or mental disabilities [(15)].

Sufficient awareness on various types and risk factors of CAs is essential for the preventative programs, and early detection of CAs is crucial for enhancing the effectiveness of the rehabilitative programs and preventing perinatal morbidities and deaths [(12)]. So, this research was carried out to evaluate incidence, risk factors and awareness of pregnant women regarding fetal congenital anomalies.

In regards to the age range of the pregnant women under study, the present study revealed that half of the women who had CAs were between the ages of thirty and less than forty. In the same way, the study made in at Hamad Medical Corporation in Qatar by **Al-Dewik et al.** [(8)] discovered that, approximately half of the participants were in the 28-43 age range with a mean age of 28.7 years. Also **Ahn et al.** [(19)] in a comprehensive review and meta-analysis concluded that maternal age ≥ 35 year is associated with CAs. On the contrast, **Colussi et al.** [(20)] found that half of the participants their age were less than 25 years. **Glick et al.** [(21)] offered a potential explanation for the previously mentioned findings, stating that a mother's age of 35 years or older is associated with a higher risk of pre-eclampsia, chromosomal abnormalities, and unfavorable maternal and neonatal outcomes such as CAs due to gestational diabetes mellitus.

The present results on the residence and family income of the pregnant women indicated that the majority of the pregnant women under study with CAs lived in rural areas, and over half of them had a family income that was sufficient. Similarly, **Kurdi et al.** [(22)] in a Saudi population discovered a sufficient family income was held by approximately two thirds of the sample and lived in rural areas.

The educational status of the pregnant women under study with CAs reveals that smaller than half of them were illiterate and more than three quarters of them were housewife. This concurs with a research carried out in Egypt by **Abdou et al.** [(23)] who showed that exceeds half of women under study had low educational level and weren't workers. The similarity between the results may be due to the same society and its social cultures. But, this result in difference with a study done by **Ajao and Adeoye** [(24)] in Nigeria who stated that over seventy five percent of the subjects had high educational level and were workers. Such dissimilarities among the results of the above mentioned study and the present one could be attributed to the difference in the sample size and its criteria of selection. Maternity nurses should be aware that education produces a better combination of input, which raises an individual's capacity and willingness to modify preventative health behaviors. This factor may have a favorable impact on the mother's health, her pregnancy-related habits (such as smoking,

seeking prenatal care), or her family's features (such as partner choice) [25]. Consanguinity is among the risk factors that strongly associated with CAs. The results of this research were consistent with **Narapureddy et al.** [1] findings in Saudi Arabia that found consanguineous marriages are linked strongly with CAs.

Regarding body mass index of the pregnant women under study with CAs, The current study's findings showed that fewer than half of them were obese. This finding was identical to the findings of the research carried out by **Kanchana and Youhasan** [26] who stated that nearly fifty percent of the research participants were obese. Also, this finding was in the same context with **Patil et al.** [27] who showed that more than fifty percent of the studied women reported high body mass index. This result indicated that obesity of women during pregnancy is one of the predisposing factors of CAs as reported in a meta-analysis study mad by **Lee et al.** [28] and revealed that obese pregnant women are more risk for CAs than non-obese pregnant women. For body mass index of the pregnant women under the study without CAs, the current study revealed that less than one third of them had normal weight. This finding agreed with the finding of **Mekonnen et al.** [29] who found that nearly two thirds of the studied women who had normal body weight didn't have fetal congenital anomalies. Also, this finding was in consistent with **Hanif et al.** [30] who clarified that non-obese pregnant women were less risk for fetal congenital anomalies.

Based on the obstetric and family history of the pregnant women under study, the current study demonstrated that the mean ± SD of women's gestational age with fetal congenital anomalies was 28.21±6.00. Also, fewer than half of the women in the study who had CAs had 5 to more than or equal 6 previous pregnancies, less than half of them had 3-4 previous labor. Also about half of them have already undergone abortions.

For history of stillbirths, over seventy five percent of the female participants in the study with CAs hadn't had previous still birth. These findings have been confirmed by **Adri et al.** [31] who demonstrated that most of the women in the study were multipara, near to three quarters of them had previous 3-5 pregnancies and hadn't previous abortion. Also, these finding were in the same direction with **Al taee and Almukhtar** [32] who observed that the majority of pregnant women had ultrasound examinations two or more times, that less than two thirds of gravida was between (1-4) once, that the number of children per life was between (1-3), and that less than three quarters of pregnant women had no history of stillbirths or abortions.

Regarding antenatal follow up, most of the studied women with fetal congenital anomalies maintained antenatal follow up; more than one third of them reported follow up every two weeks. Also, there were less than seventy five percent of them without history of delivery of child with CAs. Moreover, More than fifty percent of them of them had no history of CAs in the family. Such results explained that there were health facilities for the pregnant women to receive their health care services and maintain their routine needed care. Similarly, **Fitie et al.** [33] stated the number of prenatal care (ANC) visits they had; over half of the women in the research had less than four ANC visits, and over one-third of the participants had previously ANC services from the health facility. In the same context, **Belama et al.** [7] found that most of the studied mothers' controls received ANC and had no history of CAs in the family.

Based on the current medical history of the pregnant women under study, the present findings showed that fewer than seventy five percent of the pregnant women with CAs had maternal disease during current

pregnancy, whereas less than half of the pregnant women without CAs had disease during current pregnancy. Additionally, more than fifty percent of the women in the study who had CAs reported hypertension during pregnancy. Over one-third of the pregnant subjects in the study without CAs reported infection during pregnancy. These findings can be explained by the presence of medical condition may lead to risk for congenital anomalies as reported by **Abebe et al.** [34] who revealed that history of medical problems are predisposing factors for CAs during pregnancy.

Incidence of CAs among the total studied pregnant women (574) in this study was 7.3% during the study period. This finding may be due to the possibility of congenital abnormalities exists in every pregnancy. This result disagrees with two studies in Zagazig, Egypt [5, 6]. **Ali et al.** [6] reported the prevalence of CAs among the total sample (422 pregnant females) applying scanning ultrasonography was 3.6%. **Hassan et al.** [5] found congenital anomalies incidence was 2.47% among the overall quantity of deliveries (1254) through the study's duration. Differences between the findings of the present research and those of the previously stated study might be due to Congenital anomaly prevalence varies substantially between countries and even within the same nation's regions.

The most common types of CAs in pregnant women under the study with CAs was related to cardiovascular system (CVS) followed by Central nervous system (CNS) and urinary system, Chromosomal, Gastrointestinal system and Musculoskeletal system and head. Also, the vast minority of the studied pregnant women stated genital system congenital anomalies. Similarly, this result is consistent with **Akinmoladun et al.** [35] who said that the most common CAs were CVS (one third of them), MCAs (less than one quarter), chromosomal/genetic (one fifth), renal (less than one fifth), CNS (the minority), facial (the vast minority) and other (GIT, Resp, Urogenital, Skeletal) (the minority) anomalies. Additionally, this finding is consistent with **Belama et al.** [7] who came to the conclusion that nervous system defects were the most prevalent kind of congenital abnormality.(most of the studied sample) followed by musculoskeletal system anomalies (less than one fifth of them).

Regarding to the risk factors of CAs among the pregnant women under the study, the results of the recent study made clear that consanguinity, exposing to x-rays, pesticides air pollution and viral infection, untaken of folic acid and take drugs during pregnancy, having diabetes, obesity and polyhydramnios were the most prevalent risk factors for congenital abnormalities. These results were consistent with **Gildestad et al.** [36] who mentioned that exposure to environmental factors and untaken folic acid are factors that cause the risk of fetal anomalies. On the same line, **Al-Musawi et al.** [37] showed that weight gain, low vitamins and folic acid during pregnancy, and chronic diseases were increasing the risk of fetal congenital anomalies during pregnancy. The results of this research were confirmed by **Al Noaimi et al.** [38] who said that maternal exposure to different chemicals, air pollution and bad daily and nutritional habits lead to fetal congenital defect. In addition to another study done by **Baldacci et al.** [39] who found that the high percent of women who exposed to danger environmental factors reported different types of birth congenital abnormalities.

According to the source of background about CAs, the present study revealed that less than one third of the women under the study reported that their source of background about fetal congenital anomalies from friends, smaller than one quarter of them stated internet. While, less than

one quarter of them their source was TV and public health center, respectively. Also, the minority of the studied pregnant women stated books and others as a source of their background about fetal congenital anomalies. This result could be due to each person chooses the source of obtaining information according to what is available and accessible. These results were consistent with the research conducted by **Ogamba et al.** [(12)] who said that nearly half of the subjects under the study reported that their source of information about fetal congenital anomalies from their families, friends and internet.

According to awareness of the pregnant women under the study with CAs, The current study demonstrated that the majority of the examined women and fewer than 75.0% of them with CAs have complete correct answer regarding background about fetal congenital anomalies and types of fetal congenital anomalies, respectively. While, less than three quarters and the majority of them didn't know the diagnosis of CAs and some types of fetal congenital anomalies can be treated intrauterine, respectively. Also, less than two thirds and more than two thirds of them didn't know severe structural anomalies often need surgery shortly after birth and congenital anomalies can be treated medically after birth to a certain extent, respectively. Additionally, more than half of them didn't know that pregnancy with congenital anomalies need termination.

These results were supported with a study performed by **Mangla et al.** [(40)] who concluded that the overall level of knowledge among women with fetal congenital anomalies reported inadequate knowledge in relation to diagnosis, treatment and complications. On the contrast, **Ferede et al.** [(41)] reported that almost three-fifths of pregnant women with fetal congenital anomalies of the research participants, 25.0 % (159 people) believed that physiotherapy might be used to manage CAs.

Two-thirds of respondents knew the anomalies that need surgery in CAs. From the researchers' point of view, these results may be attributed to lack of educational program provided to pregnant women about fetal congenital anomalies from health care institutions. So, they may obtain information from other source.

Additionally, the present study revealed that more than three quarters and less than one quarter of the studied women without fetal congenital anomalies have complete correct answer regarding background about fetal congenital anomalies and definition of fetal congenital anomalies, respectively. Also, more than two thirds of them had complete correct answer regarding the types of fetal congenital anomalies and risk factors for developing congenital anomalies in the fetus, respectively. While, most and more than half of them didn't know diagnosis of fetal congenital anomalies and severe structural anomalies often need surgery shortly after birth, respectively. These results were similar to **Dogan et al.** [(42)] who found that adequate knowledge of pregnant women about fetal congenital anomalies definition, its types and risk factors for developing congenital anomalies in the fetus. On the same line, **Samami et al.** [(43)] stated that over half of women had good knowledge of congenital anomalies and its preventable risk factors.

Regarding the overall awareness of CAs, the current study showed that a majority of the pregnant women under study who had CAs exhibited unsatisfactory degree of overall awareness. Conversely, fewer than 25.0% of them had satisfactory degree of overall awareness on CAs. This finding was in the same direction with **Sidhu et al.** [(44)] who found that near to two thirds of the participants who reported fetal anomalies had limited awareness regarding congenital malformations.

Also, this finding agreed with **Taye et al.** [45] who found that about half of the participants' awareness on congenital malformations was poor awareness. This finding is in the same direction with **Colussi et al.** [20] who found that near to two thirds of the participants who reported fetal anomalies had limited knowledge regarding congenital malformations. Also, this finding agreed with **Taye et al.** [45] who found that about half of the participants' awareness on congenital malformations had poor awareness.

Also, this study finding was in the same context with **Fitie et al.** [33] who found that more than three quarters of the studied mothers had unsatisfactory level of knowledge regarding congenital anomalies among children. But, this finding was in difference with **Kanchana and Youhasan** [26] who discovered that a greater percentage of participants had adequate general awareness regarding birth defect preventative measures, preconception care, and risk factors. This discrimination with results might be due to less than half of the studied pregnant women with fetal congenital anomalies were illiterate and that's may the reason to have low level of awareness about congenital anomalies and unaware how to improve their level of awareness.

Also, this result may be due to lack of organized educational program provided from different health care institutions to pregnant women about congenital anomalies that leading to low level of awareness of the studied women. According to correlation between risk factors of CAs and total awareness score regarding CAs among the studied pregnant women with fetal congenital anomalies, the present study revealed that there was highly significant negative correlation between total women' awareness and exposure to x-rays, pesticides and heavy materials as lead and mercury Also, there was a statistically negative correlation between total women' awareness and eating uncooked meat and malnutrition (Overweight). This result is congruent with the study achieved by **Patil et al.** [27] who found that there was a highly statistically significant relation between total awareness level of the studied women and their exposure to risk factors of CAs. Also, this finding was consistent with **Mekonnen et al.** [29] who reported that statistically significant positive correlations between total awareness scores and exposure to risk factors of CAs.

Conclusion:

The current study's results prompted the following conclusion:

- Among pregnant women at Zagazig University Hospital, the incidence of CAs was 7.3%.
- The cardiovascular system (CVS), the central nervous system (CNS), the urinary system, the chromosomal, gastrointestinal tract, musculoskeletal system, and the head were the most common fetal congenital anomalies among pregnant women at Zagazig University Hospital.
- Fetal congenital abnormalities were strongly associated with consanguinity, exposure to x-rays, pesticides, air pollution, not taking folic acid and use drug during pregnancy, exposure to viral infection, diabetes, and polyhydramnios.
- Three quarters of the studied pregnant women with fetal congenital anomalies had unsatisfactory level of total awareness regarding fetal congenital anomalies.

Recommendations:

The following recommendations were provided by the researchers in light of the study's findings:

- Employing educational nursing programs can help in raising women's awareness and

preventive measures about CAs.

- Premarital testing and preconception counseling particularly for consanguineous married couples can be extremely helpful in educating about potential dangers and assisting them in making well-informed decisions on family planning.
- Preconception, periconception, and neonatal screening of women for the early diagnosis and management of CAs.
- Emotional and social support to alleviate pregnant women's anxiety when they have prenatal diagnosis of fetal congenital anomalies.
- **Future researches:**

1. Longer-term research is needed to identify more congenital abnormalities and their preventable causes.

2. A larger sample size can be used in future studies to make the findings more widely known.

Table (1): Distribution of the studied pregnant women according to their demographic characteristics (n=574)

Demographic characteristics	Fetal Congenital Anomalies			
	With (n=42)		Without (n=532)	
	No.	%	No.	%
Age (year)				
<20	0	0.0	56	10.5
20-<30	12	28.6	301	56.6
30-<40	21	50.0	147	27.6
≥ 40	9	21.4	28	5.3
Mean ± SD	33.07±7.17		26.99±6.45	
Residence				
Rural	34	81.0	325	61.1
Urban	8	19.0	207	38.9
Educational level				
Illiterate	20	47.6	84	15.8
Read and write	3	7.2	63	11.8
Primary education	5	11.9	42	7.9
Secondary education	9	21.4	77	14.5
High education	5	11.9	266	50.0
Work condition				
Housewife	32	76.2	434	81.6
Working	10	23.8	98	18.4
If working, type of occupation is	**(n=10)**			**(n=98)**
Nurse	0	0.0	42	42.9
Teacher	1	10.0	14	14.3
Worker	8	80.0	21	21.4
Employee	0	0.0	7	7.1
Others	1	10.0	14	14.3
Family income				
Sufficient	23	54.8	332	62.4
Just meet life expenses	14	33.3	151	28.4
Not sufficient	5	11.9	49	9.2
Consanguinity				
Yes	24	57.1	238	44.7
No	18	42.9	294	55.3

Others refer to lawyer, engineer and social specialist.

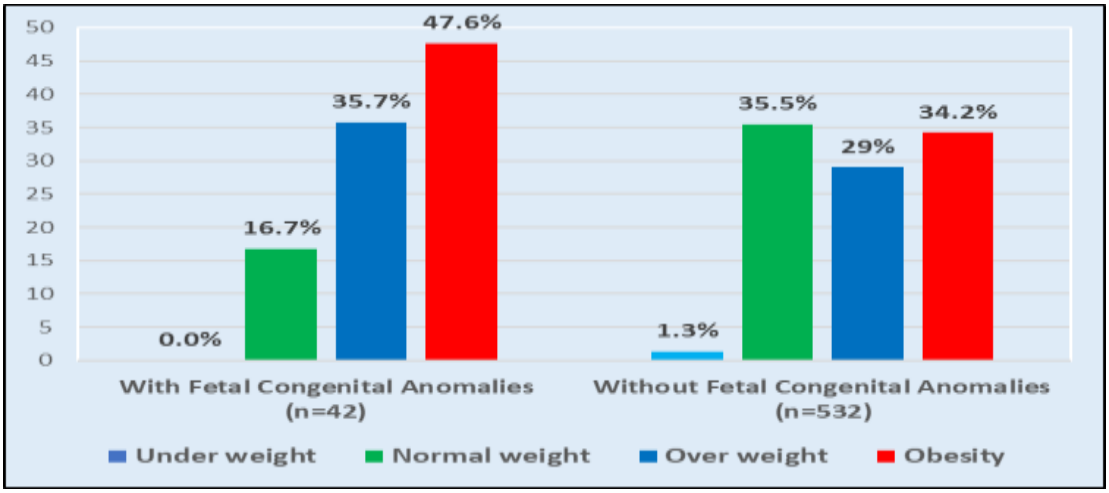

Figure (2): Percentage distribution of the studied pregnant women according to their body mass index (n=574)

Table (2): Distribution of the studied pregnant women according to their obstetrical and family history (n=574)

Obstetric and family history	Fetal Congenital Anomalies			
	With (n=42)		Without (n=532)	
	No.	%	No.	%
Current gestational age (weeks)				
Second trimester	14	33.3	210	39.5
Third trimester	28	66.7	322	60.5
Mean ± SD	28.21±6.00		27.42±6.43	
Gravidity				
1- 2	13	31.0	350	65.8
3- 4	9	21.4	105	19.7
5- ≥6	20	47.6	77	14.5
Parity				
None	10	23.8	189	35.5
1-2	12	28.6	259	48.7
3-4	19	45.2	77	14.5
5-6	1	2.4	7	1.3
History of abortion				
Yes	26	61.9	154	28.9
No	16	38.1	378	71.1
History of stillbirths				
Yes	9	21.4	63	11.8
No	33	78.6	469	88.2
Antenatal follow up				
Yes	37	88.1	518	97.4
No	5	11.9	14	2.6
If yes, number of antenatal visits	**(n=37)**		**(n=518)**	
Every one week	7	18.9	56	10.8
Every 2 weeks	16	43.3	266	51.4
Every one month	14	37.8	196	37.8
History of delivery of child with congenital anomalies				
Yes	11	26.2	32	6.0
No	31	73.8	500	94.0
Family history of congenital anomalies				
Yes	14	33.3	77	14.5
No	28	66.7	455	85.5

Table (3): Distribution of the studied pregnant women according to their encountered disease during current pregnancy (n=574)

Encountered maternal disease during current pregnancy	Fetal Congenital Anomalies			
	With (n=42)		Without (n=532)	
	No.	%	No.	%
Maternal disease during current pregnancy				
Yes	31	73.8	224	42.1
No	11	26.2	308	57.9
***If yes, type of maternal disease**	**(n=31)**		**(n=224)**	
Diabetes	13	41.9	61	27.2
Infection during pregnancy	2	6.5	82	36.6
Hypertension with pregnancy	18	58.1	78	34.8
Thyroid diseases	2	6.5	7	3.1
Toxoplasmosis	0	0.0	0	0.0
Rubella	1	3.2	0	0.0
Placenta accrete	2	6.5	10	4.5
Acute deep venous thrombosis	1	3.2	0	0.0
Heart disease	0	0.0	7	3.1
Severe anemia	14	45.2	28	12.5
Polyhydramnios	5	16.1	32	14.3
Oligohydramnios	9	29.03	59	26.3

(*) Mutual response more than 100.0% (women have more than one answers). Infection during pregnancy includes; Hypertension with pregnancy includes preeclampsia, chronic hypertension and gestational hypertension

Table (4): Incidence of congenital anomalies among the studied pregnant women (percent and per thousand). (n=574)

Total no. of pregnant women	Fetal Congenital Anomalies		
	No.	% Per 100	% Per 1000
574	42	7.31	73.1

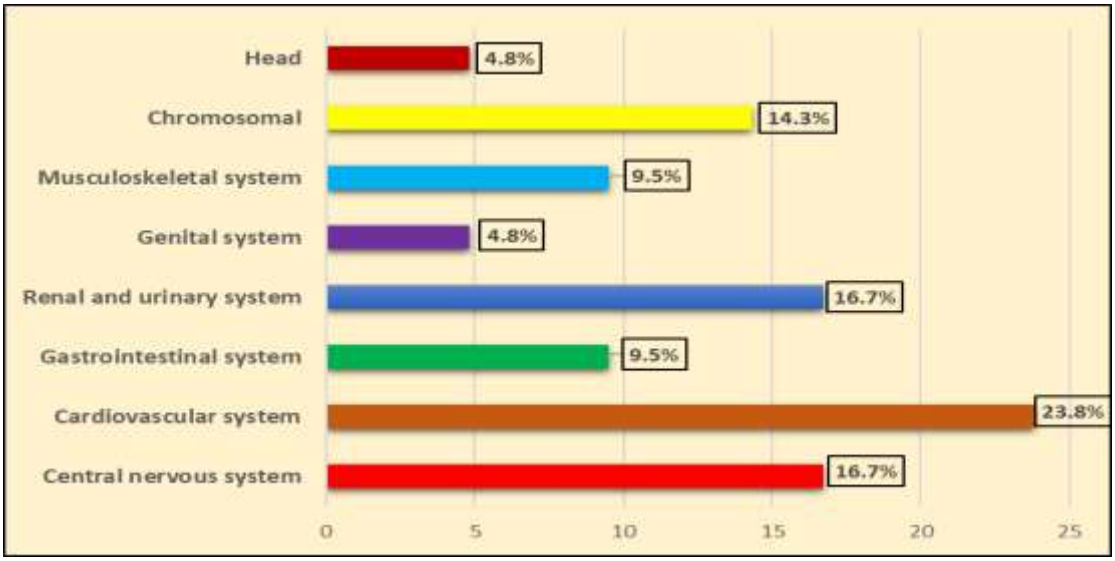

Figure (3): Percentage distribution of different types of congenital anomalies according to the involved system (n=42)

Table (5): Distribution of the studied pregnant women according to their risk factors of fetal congenital anomalies (n=574)

Items	Fetal Congenital Anomalies							
	With (n=42)				Without (n=532)			
	Yes		No		Yes		No	
	No.	%	No.	%	No.	%	No.	%
Consanguinity	24	57.1	18	42.9	238	44.7	94	55.3
Exposure to physical agents								
Passive smoking	42	100.0	0	0.0	500	94.0	32	6.0
Exposure to x-rays	10	23.8	32	76.2	14	2.6	518	97.4
Hyperthermia	1	2.4	41	97.6	7	1.3	525	98.7
Exposure to chemical agents								
Drinking alcohol	0	0.0	42	100.0	0	0.0	532	100.0
Exposure to toxic chemicals	0	0.0	42	100.0	0	0.0	532	100.0
Exposure to pesticides	10	23.8	32	76.2	0	0.0	532	100.0
Heavy materials	4	9.5	38	90.5	0	0.0	532	100.0
Exposure to environmental agents								
Living near to a hazardous waste site	5	11.9	37	88.1	7	1.3	525	98.7
Exposure to air pollution	12	28.6	30	71.4	7	1.3	525	98.7
Exposure to radiation	8	19.0	34	81.0	10	1.9	522	98.1
Poor water quality	17	40.5	25	59.5	56	10.5	476	89.5
Exposure to nutritional agents								
Eating fast food	17	40.5	25	59.5	105	19.7	427	80.3
Eating uncooked meat	16	38.1	26	61.9	87	16.4	445	83.6
Excessive amount of vit A	6	14.3	36	85.7	36	6.8	496	93.2
Untaken of folic acid	20	47.6	22	52.4	42	7.9	490	92.1
Unclean vegetables and fruits	13	31.0	29	69.0	43	8.1	489	91.9
Malnutrition(Underweight)	0	0.0	42	100.0	7	1.3	525	98.7
Malnutrition (Overweight)	35	83.3	7	16.7	336	63.2	196	36.8
Drinking caffeine more than 400mg daily	21	50.0	21	50.0	100	18.8	432	81.2
Exposure to drugs								
Take drugs during pregnancy	28	66.7	14	33.3	231	43.4	301	56.6
Exposure to infectious agents								
Exposure to viral infection	1	2.4	41	97.6	0	0.0	532	100.0
Exposure to Hepatitis B&C	5	11.9	37	88.1	35	6.6	497	93.4

Table (6): Bivariate analysis of the predisposing risk factors for fetal congenital anomalies among the studied pregnant women (n=574)

Predisposing risk factors	Risk Estimate			X^2	p-value
	Odds Ratio	(95% Confidence Interval)			
		Lower	Upper		
Consanguinity	9.321	3.503	25.101	22.63	0.001**
Exposure to physical agents					
Passive smoking	0.923	0.900	0.945	2.675	0.102
Exposure to x-rays	**11.563**	4.765	28.06	43.57	0.000**
Hyperthermia	1.829	0.220	15.229	0.321	0.571
Exposure to chemical agents					
Exposure to pesticides	**17.625**	12.589	24.676	128.91	0.000**
Heavy materials as lead and mercury	15.000	11.033	20.394	51.02	0.000**
Exposure to environmental agents					
Living near to a hazardous waste site	10.135	3.068	33.485	21.32	0.000**
Exposure to air pollution	**30.000**	11.013	81.722	90.35	0.000**
Exposure to radiation	12.282	4.553	33.131	37.77	0.000**
Poor water quality	5.780	2.941	11.358	7.456	0.015*
Exposure to nutritional agents					
Eating fast food	2.765	1.441	5.308	10.00	0.002**
Eating uncooked meat as lunchon and beef	3.148	1.621	6.113	12.49	0.000**
Excessive amount of vit A	2.296	.908	5.809	3.245	0.035*
Untaken of folic acid	**10.606**	5.359	20.990	63.75	0.000**
Unclean vegetables and fruits	5.098	2.470	10.522	23.12	0.000**
Malnutrition (Underweight)	1.080	1.055	1.105	4.558	0.037*
Malnutrition (Overweight)	2.917	1.271	6.692	6.932	0.008**
Drinking caffeine more than 574 gm daily	4.320	2.272	8.216	22.78	0.000**
Exposure to drugs					
Take drugs during pregnancy	**2.606**	1.341	5.063	8.495	0.004**
Exposure to infectious agents					
Exposure to viral infection as measles or cytomegalovirus	**13.976**	10.406	18.770	12.68	0.000**
Exposure to Viral hepatitis as (Hepatitis B, Hepatitis C)	1.919	.710	5.189	3.703	0.009**
Vaccination against infectious diseases	7.400	2.806	19.515	21.75	0.000**
Health conditions					
Diabetes	**3.461**	1.708	7.015	13.16	0.000**
Severe anemia	2.134	1.084	4.200	5.002	0.025*
Preeclampsia	2.129	1.027	4.416	4.290	0.038*
Polyhydramnios	2.111	.777	5.739	2.239	0.049*
Oligohydramnios	2.186	.997	4.794	3.984	0.046*
Obesity	2.319	1.017	5.289	4.212	0.040*

X2: Chi-square test. No significant at p >0.05. * Significant at p ‹ 0.05. **Highly significant at p ‹ 0.01.

Table (7): Distribution of the studied pregnant women according to their awareness regarding fetal congenital anomalies (n=574)

Awareness Items	Fetal Congenital Anomalies											
	With (n=42)						Without (n=532)					
	Complete correct answer		Incomplete correct answer		Don't know		Complete correct answer		Incomplete correct answer		Don't know	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Background	34	81.0	0	0.0	8	19.0	420	78.9	0	0.0	112	21.1
Definition	24	57.1	7	16.7	11	26.2	378	71.1	49	9.2	105	19.7
Types	30	71.4	1	2.4	11	26.2	343	64.5	91	17.1	98	18.4
Risk factors	15	35.7	10	23.8	17	40.5	371	69.7	63	11.9	98	18.4
Prevention	6	14.3	8	19.0	28	66.7	329	61.8	70	13.2	133	25.0
Diagnosis	4	9.5	7	16.7	31	73.8	84	15.8	14	2.6	434	81.6
Complications	22	52.4	7	16.7	13	30.9	336	63.2	77	14.4	119	22.4
Some types of fetal congenital anomalies can be treated intrauterine	3	7.1	0	0.0	39	92.9	315	59.2	0	0.0	217	40.8
Severe structural anomalies often need surgery shortly after birth	16	38.1	0	0.0	26	61.9	224	42.1	0	0.0	308	57.9
Congenital anomalies can be treated medically after birth to a certain extent	15	35.7	0	0.0	27	64.3	259	48.7	0	0.0	273	51.3
Pregnancy with congenital anomalies need termination	18	42.9	0	0.0	24	57.1	238	44.7	0	0.0	294	55.3
Are congenital anomalies incompatible with survival	28	66.7	0	0.0	14	33.3	336	63.2	0	0.0	196	36.8

Figure (4): Percentage distribution of the studied pregnant women according to their total awareness regarding fetal congenital anomalies

Table (8): Correlation between risk factors of fetal congenital anomalies and total awareness score regarding fetal congenital anomalies among the studied pregnant women with fetal congenital anomalies (n=42)

Risk factors of fetal congenital anomalies	Total awareness score	
	r	p-value
Exposure to physical agents		
Passive smoking	0	0
Exposure to x-rays	-0.525-	0.000**
Hyperthermia	-0.082	0.608
Exposure to chemical agents		
Exposure to pesticides	-0.525-	0.000**
Heavy materials	-0.424-	0.005**
Exposure to environmental agents		
Living near to a hazardous waste site	-0.192-	0.223
Exposure to air pollution	-0.202-	0.200
Exposure to radiation	-0.253-	0.106
Poor water quality	-0.194-	0.218
Exposure to nutritional agents		
Eating fast food	-0.076-	0.632
Eating uncooked meat	-0.307-	0.048*
Excessive amount of vit A	-0.047-	0.766
Untaken of folic acid	-0.033-	0.835
Unclean vegetables and fruits	-0.152-	0.335
Malnutrition (Underweight)	0	0
Malnutrition (Overweight)	-0.389-	0.011*
Drinking caffeine more than 574 gm daily	-0.058-	0.715
Exposure to drugs		
Take drugs during pregnancy	0.000	1.000
Exposure to infectious agents		
Exposure to viral infection	-0.082-	0.608
Exposure to Viral Hepatitis B & Hepatitis C	-0.192-	0.223
Vaccination against infectious diseases	-0.078-	0.624
Health conditions		
Diabetes	-0.278-	0.075
Severe anemia	-0.123-	0.437
Preeclampsia	-0.179-	0.256
Polyhydramnios	-0.013-	0.936
Oligohydramnios	-0.273-	0.081
Obesity	-0.042-	0.791

r= Spearman correlation coefficient test. **highly statistically significant at p < 0.01.
* Statistically significant at p < 0.05. No statistically significant at p > 0.05.

References:

1. Narapureddy, B.R., Zahrani, Y., Alqahtani, H.E.M. et al. Examining the Prevalence of Congenital Anomalies in Newborns: A Cross-Sectional Study at a Tertiary Care Maternity Hospital in Saudi Arabia. *Children*. 2024; 11: 188. https://doi.org/10.3390/children11020188.
2. Rasmussen, S.A., Erickson, J.D., Reef, S.E., and Ross, D.S. Teratology: From science to birth defects prevention. *Birth defects research. Part A, Clinical and molecular teratology*.2009; 85(1): 82-92. https://doi.org/10.1002/bdra.20506
3. Boyle, B., Addor, M., Arriola, L., et al. Estimating Global Burden of Disease due to congenital anomaly: an analysis of European data. Archives of disease in childhood. *Fetal and Neonatal Edition*. 2018; 103(1): 22-28.
4. Shawky, R.M., and Sadik, D.I. Congenital malformations prevalent among Egyptian children and associated risk factors. *Egyptian Journal of Medical Human Genetics*. 2011; 12(1):69-78. https://doi.org/10.1016/j.ejmhg.2011.02.016.
5. Hassan, A.H.M., Fayyadh, A.H.M., and Elsadek, A.H. Prevalence of Congenital Malformations among Neonates at Al-Ahrar Teaching Hospital. *The Egyptian Journal of Hospital Medicine*. 2022; 89: 5414-5419.
6. Ali, A.E., El-Sayed, G.A., Hamed, B.M., et al. Prevalence Rate of Congenital Fetal Malformations in Second Trimester by Ultrasound Scanning in Zagazig University Outpatient Clinic. *The Egyptian Journal of Hospital Medicine*. 2021; 85 (2): 3889-3992.
7. Belama, N., Desalew, A., Lami, M., et al. Predictors of congenital anomalies among neonates admitted to public hospitals in eastern Ethiopia: a case-control study. *Journal of International Medical Research*. 2024; 52(3): 1-13.
8. Al Dewik, N., Samara, M., Younes,S. et al. Prevalence, predictors, and outcomes of major congenital anomalies: A population based register study. *Scientific Reports*. 2023; 13: 2198. https://doi.org/10.1038/s41598-023-27935-3.
9. Ibrahim, N.A.S., Elshorbagy, K.H., Darweish, A.N., et al. Two-dimensional and four-dimensional ultrasound in the diagnosis of non-cardiac fetal congenital anomalies in high risk pregnancies: a comparative study. *Egyptian Journal of Radiology and Nuclear Medicine*. 2023; 54(1): 205.
10. Sadlecki, P., and Walentowicz-Sadlecka, M. Prenatal diagnosis of fetal defects and its implications on the delivery mode. *Open Medicine*. 2023; 18(1): 20230704.
11. Geda, Y.F., Lamiso, Y.Y., Berhe, T.M. et al. Prevalence and associated factors of structural congenital anomalies in resource limited setting, 2023: a systematic review and meta-analysis. *Front. Pediatr*. 2023; 11: 1146384. https://doi.org/10.3389/fped.2023.1146384
12. Ogamba, C.F., Roberts, A.A., Babah, O.A. et al. Correlates of knowledge of genetic diseases and congenital anomalies among pregnant women attending antenatal clinics in Lagos, South-West Nigeria. *Pan African Medical Journal*. 2021; 38:310. https://doi.org/10.11604/pamj.2021.38.310.26636
13. Mohamed, H.A.O., Tosson, M.M., and Abd Elkhalek, N.K. Effect of Coping Strategies Education on Pregnant Women's Knowledge and Anxiety with Detected Fetal Anomalies. *Egyptian Journal of Health Care*. 2022; (13)2: 640-654.
14. Tiruneh, G.T., Birhanu, T.M., Seid, A., et al. Systematic review neonatal mortality in 10 Journal of International Medical Research neonatal intensive care unit hospitals in Ethiopia remains unacceptably high: a systematic review and meta-analysis: magnitude and determinants of neonatal mortality in NICU. *Ethiop Med J*. 2021; 59: https://emjema.org/index.php/EMJ/article/view/1588.

15. WHO. Birth Defects: Fact sheet [Internet]. WHO Library. WHO Press, World Health Organization; 2022. Available at: https://apps.who.int/gb/ebwha/pdf_files/WHA63/A63_R17-en.pdf?ua=1

16. Shalaby, A.M., and EL-Gazzar, A.F. The Frequency, Types and Risk Factors of Congenital Anomalies in a Tertiary Neonatal Intensive Care Unit (A hospital based study). *Annals of Neonatology Journal* 2021; 3(1): 24-45.

17. Alhamdan, W., Moukaddem, A., AlOtaibi, N., et al. Knowledge regarding teratogens among women of childbearing age at a large tertiary care center in Saudi Arabia. *J Family Med Prim Care*. 2020; 9:3088-93.

18. Helmy, H.K., Ibrahim, S.I.A., Mahmoud, O.E., et al. Effect of Antenatal Nursing Interventions on Knowledge, Attitudes and Coping Strategies of Pregnant Women who Detected Fetal Anomalies regarding Congenital Anomalies. *Egyptian Journal of Health Care (EJH)*. 2021; 12(3):131-145.

19. Ahn, D., Kim, J., Kang, J. et al. Congenital anomalies and maternal age: A systematic review and metaanalysis of observational studies. *Acta obstetricia et gynecologica Scandinavica*. 2022; 101(5): 484-498.

20. Colussi, C.L., Racigh, N., Poletta, G.L., and Simoniello, M.F. Prenatal risk factors for selected congenital anomalies development: a case-control pilot study in postpartum women from Argentina. *Journal of Pediatric and Neonatal Individualized Medicine*. 2023; 12(1): e120109.

21. Glick, I., Kadish, E., and Rottenstreich, M. Management of Pregnancy in Women of Advanced Maternal Age: Improving Outcomes for Mother and Baby. *International Journal of Women's Health*. 2021; 13: 751-759.

22. Kurdi, A.M., Majeed-Saidan, M. A., Al Rakaf, M. S., et al. Congenital anomalies and associated risk factors in a Saudi population: a cohort study from pregnancy to age 2 years. *BMJ open*. 2019; 9: e026351.

23. Abdou, M.S.M., Sherif, A.A.R., Wahdan, I.M.H., and Ashour, K.S.E.D. Pattern and risk factors of congenital anomalies in a pediatric university hospital, Alexandria, Egypt. *Journal of the Egyptian Public Health Association*. 2019; 94: 1-9.

24. Ajao, A.E., and Adeoye, I.A. Prevalence, risk factors and outcome of congenital anomalies among neonatal admissions in OGBOMOSO, Nigeria. *BMC pediatrics*. 2019; 19: 1-10.

25. Radwan, N.E.M., El-Din, S.A.N., and Mohamed, A.H.G. Risk factors and pregnancy outcomes of preterm labor. 2015. Master thesis. P.97.

26. Kanchana, K.T.G., and Youhasan, P. Knowledge and attitudes on fetal anomalies among pregnant women in teaching hospital mahamodara, galle. *International Journal of Public Health*. 2018; 7(4): 231-235.

27. Patil, S.S., Pardeshi, P.B., and Sambarey, P.W. Congenital anomalies in fetus during pregnancy-predisposing factor and management in rural set up. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*. 2018; 7(8): 3173-3179.

28. Lee, K.S., Choi, Y.J., Cho, J., et al. Environmental and genetic risk factors of congenital anomalies: an umbrella review of systematic reviews and meta-analyses. *Journal of Korean medical science*. 2021; 36(28).

29. Mekonnen, A.G., Hordofa, A.G., Kitila, T.T., and Sav, A. Modifiable risk factors of congenital malformations in bale zone hospitals, Southeast Ethiopia: an unmatched case-control study. *BMC pregnancy and childbirth*. 2020; 20: 1-9.

30. Hanif, S., Zubair, M., Shabir, N., and Zia, M.S. A comparative study of maternal and fetal outcome in obese and non-obese pregnant women. *Journal of The Society of Obstetricians and Gynaecologists of Pakistan*. 2020; 10(2): 96-101.

31. Adri, I., Touloun, O., and Boussaa, S. Prevalence and Risk Factors for Congenital Malformations in Morocco*. Middle East Journal of Rehabilitation and Health Studies*. 2024; 11(4).

32. Al taee, E.A., and Almukhtar, S.H. Screening of the Risk Factors for Congenital Anomalies in Pregnant Women Attending Maternity and Obstetric Hospitals at Mosul City. *Pakistan Journal of Medical and Health Sciences*. 2021; 44(5):1587-1596.

33. Fitie, G.W., Endris, S., Abeway, S., and Temesgen, G. Pregnant mother's knowledge level and its determinant factors towards preventable risk factors of congenital anomalies among mothers attended health institutions for antenatal care, Ethiopia. *Clinical Epidemiology and Global Health*. 2022; 14: 100973.

34. Abebe, S., Gebru, G., Amenu, D., Mekonnen, Z., and Dube, L. Risk factors associated with congenital anomalies among newborns in southwestern Ethiopia: A case-control study. *PloS one*. 2021; 16(1): e0245915.

35. Akinmoladun, J.A., Famosaya, I. D., and Ogbole, G.I. Pattern and distribution of prenatally diagnosed congenital anomalies among high risk pregnant women in Ibadan, South Western Nigeria. *Pan African Medical Journal*. 2022; 41(1).

36. Gildestad, T., Bjørge, T., Haaland, Ø. A., et al. Maternal use of folic acid and multivitamin supplements and infant risk of birth defects in Norway, 1999-2013. *British Journal of Nutrition*. 2020; 124(3): 316-329.

37. Al-Musawi, K.M., Shawq, A.H., Majeed, Z., et al. Risk factors for congenital anomalies in neonatal intensive care unit in Baghdad city. *Medico Legal Update*. 2020; 20(1):1168-74.

38. Al Noaimi, G., Yunis, K., El Asmar, K., et al. Prenatal exposure to criteria air pollutants and associations with congenital anomalies: A Lebanese national study. *Environmental Pollution*. 2021; 281:117022.

39. Baldacci, S., Gorini, F., Santoro, M., et al. Environmental and individual exposure and the risk of congenital anomalies: a review of recent epidemiological evidence. *Epidemiol Prev*. 2018; 42(3-4):1-34.

40. Mangla, M., Sree, K.D.S., Kumar, N., and Panda, M. Knowledge and Attitude of Young Married Women Regarding Congenital Anomalies in the Fetus: A Cross-Sectional Questionnaire-Based Study from South-Central India. *Journal of Fetal Medicine*. 2023; 10(01): 029-035.

41. Ferede, A.A., Kassie, B.A., Mosu, K.T., et al. Pregnant women's knowledge of birth defects and their associated factors among antenatal care attendees in referral hospitals of Amhara regional state, Ethiopia, in 2019. *Frontiers in Global Women's Health*. 2023; 4: 1085645.

42. Doğan, Y., Koçkaya, E., Eser, M. D., and Daryal, A. S. Pregnant women’s background knowledge, expectations and attitude about second trimester detailed ultrasound scan. *Acta Medica Nicomedia*. 2023; 6(3):395-402.

43. Samami, E., Seyedi-Andi, S.J., Bayat, B., et al. The effect of educational intervention based on the health belief model on knowledge, attitude, and function of women about Pap smear test at Iranian health centers: A randomized controlled clinical trial. *Journal of education and health promotion*, 2021; 10: 22. https://doi.org/10.4103/jehp.jehp_33_2.

44. Sidhu, G., Kaur, H., Kaur, I., and Kaur, J. Knowledge and Attitude regarding Congenital Malformations among Married Women. *Asian Journal of Nursing Education and Research*. 2017; 7(3): 379-383.

45. Taye, M. Parents’ perceived knowledge and beliefs on congenital malformations and their causes in the Amhara region, Ethiopia. A qualitative study. *Plos one*. 2021; 16(11), e0257846.