Impact of Inter-pregnancy Interval on Obstetrical and Psychological Complications among Reproductive Aged women

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Abstract: **Short and long inter-pregnancy intervals have an adverse effect on maternal, fetal, and neonatal outcomes. The purpose of this study was to identify the impact of inter-pregnancy interval on obstetrical and psychological complications among women in the reproductive age. A cross-sectional design was adopted. The current study was conducted on 200 postpartum women divided into two groups short and long IPI. Three instruments were used to collect the data; Structured Interviewing questionnaire, Generalized Anxiety Disorder questionnaire, and (PHQ-9 Depression Scale). The present study findings revealed that, short IPI was a risk factor for anemia, gestational diabetes, preterm labor, and floppy uterus (P<0.0001). Long IPI was associated with pre-eclampsia, PIH, antepartum hemorrhage, and stillbirth (P<0.0001). Moreover, short and long IPI causes anxiety and depression after delivery. The study concluded that short and long IPI is a strong risk factors for obstetrical and psychological complications. The study recommended that awareness programs are needed to raise women's level of knowledge regarding the adverse impact of short and long inter-pregnancy intervals and achieve the optimal interpregnancy interval by the effective use of family planning programs.**

Keywords: **Inter-pregnancy interval, short inter-pregnancy interval, long inter-pregnancy Interval, obstetrical complications, psychological complications.**

I.   INTRODUCTION

Inter-pregnancy interval period (IPI) is defined by *(DaVanzo,Hale, Razzaque, 2008)* as "the period considered between the birth of a live birth and another conception". Short inter-pregnancy interval is estimated to be from less than six to less than twenty seven months. Pregnancy should be postponed for at least twenty four months, but not longer than fifty nine months. After abortion or miscarriage, pregnancy should be late for at least six months **(Ricci, & Kyle, 2009) &** *(Ragab et al., 2015)*. The span of time between birth and conception of the subsequent pregnancy (inter-pregnancy interval or IPI) or birth of the next child (inter-birth interval) is linked with outcomes of the subsequent pregnancy *(Iheukwumere CB., et al., 2016)*.

The normal inter-pregnancy interval duration had big debate in identification of normal span between pregnancy and another one. Numerous researches ranged the normal inter-pregnancy interval according to many factors related to women, and   their environment but, It is important to note that social issues, including factors such as social exclusion, gender equity, education, and employment play a major role towards maternal health *Mahmood, et al., (2018)*. The most common factor was the biological mechanism between short inter pregnancy interval and poor maternal and neonatal outcomes which is hypothesized to be due to insufficient time for the mother to recover from the nutritional load, strain, and stress of the previous pregnancy *Elizabeth J. et al., (2013)*.

Moreover, researcher's efforts assured that, Not only normal inter-pregnancy interval (NIPI) is the period between birth of the preceding infant and conception of the current pregnancy of eighteen to thirty-six months. *Yohannes S, Wondafrash M, Abera M, Girma E., (2011)*. But also, Nonoptimal IPI (inter-pregnancy interval) that is either short or long endorses to adverse maternal and perinatal outcomes in both low- and high-income countries *Mahfouz.et al., (2018)*. The concept of an ideal inter-pregnancy interval developed from a report issued by World Health Organization (WHO) in 2005. Based on the best available evidence at that time, the specialists gotten a consensus of twenty four months as the IPI. This interval was consistent with the joint WHO and United Nations Children's Emergency Fund (UNICEF) recommendation that women breastfeed for at least two years *(World Health Organization 2005)*.

Another study by (*Janša V, et al., 2018 *) Recommended that, the optimal time to conceive after a previous birth is fifteen months, as longer or shorter interval are associated with increased risk of preterm birth. Women with short or long inter-pregnancy intervals were one and half times more likely to experience preterm birth. Poorly timed pregnancies increase health risks for both mother and infant while optimal interpregnancy interval is an important determinant of maternal health and pregnancy outcomes *Conde-Agudelo A, et al., (2007), & Conde-Agudelo A et al., (2006)*.

Birth interval is a major determinant of the rates of fertility and maternal health. *Conde-Agudelo et al. (2006)*. Fertility of women is affected by the many factors such as lower age at marriage, low level of literacy, poor standard of living, universality of marriage, limited use of contraceptives, traditional way of life, religion and preference for a male child, caste, social and cultural factors etc.*(Park K., 2000)*.There were many factors affecting on pregnancy outcomes. They were inter-pregnancy interval, hereditary, environmental and bio-social factors like maternal age, parity, socio-economic factors, education, availability of health services, past obstetrics history etc. Besides that, maternal diseases like diabetes, hypertension, antepartum hemorrhage. In addition to anemia, and infection are common obstetric factors responsible for poor pregnancy outcome. Most of these poor outcomes are preventable, in case of early recognition of such cases along with educative measures are instituted in time *Ahmed F., et al., (2010)*.

Long intervals are assumed to be a consequence of infecundity and its associated poor pregnancy outcomes, while short intervals are believed to affect maternal, infant and child morbidity and mortality through the maternal depletion syndrome *Dewey KG, Cohen RJ, (2007)*. The World Health Organization estimated that about eight hundred women die from pregnancy and childbirth-related complications around the world daily and 289,000 women died during and following pregnancy and delivery in 2013. All of these deaths occurred in developing countries, and most of them could have been prevented. Reduction of maternal morbidity and mortality has long been a global health priority *Verma R., (2019)*.

World Health Organization reported that 3.5% of women die related to obstetric complications during pregnancy and childbirth and about 860 women die from complications during pregnancy and childbirth in 2013. Neonatal mortality is estimated to be 22.749 neonates in Egypt *World Health Organization, (2013)*.

In addition to Maternal mortality in Tanzania is 454 deaths per hundred thousand live births with Neonatal mortality of 26 deaths per 1000 live births **United *Republic of Tanzania , (2008)*. The maternal ,fetal, and neonatal outcomes among parturient women with SIPI compared with LIPI in Tanzania have not been appointed. Determination of obstetric complications among women with SIPI will help fine-tune efforts towards accelerating attainment of Maternal Gestational Diabetes Mellitus (MGDM) *Health MO ,(2010)*. A similar cross-sectional study done in Addis Ababa, Ethiopia showed that short birth to pregnancy interval less than twenty four months is influenced by mothers' educational status of tertiary education level, having previous mode of delivery through cesarean section and having chronic medical problem. Long birth to pregnancy interval more than sixty months is also influenced by planned pregnancy and preceding birth delivered through spontaneous vaginal delivery *Berhanu A, F. Enquoselassie, Lukman Y. (2010)*.

Birth interval or inter-pregnancy interval influence maternal health as physical, obstetrical outcomes as well as psychological outcomes. Some researchers advocate that women are more susceptible to anxiety, depression and post-traumatic stress when a new conception occurs soon less than one year especially after the stillbirth *Cacciatore J, Radestad I, Frederik Froen J.(2008) (Turton P, Hughes P, Evans CD, Fainman D.(2001)*. Instead, the degree of grief and psychological distress may manifest itself even stronger if a woman struggles for a long time to become pregnant again *Christoffersen L. Helsevesenet ved dødfødsel (2008) and. Franche RL.(2001)* and women pregnant after a previous loss may show less symptoms of depression compared with their non-pregnant counterparts *Hughes PM, Turton*

P, Evans CD.,(1999). Conventionally women with a short inter-pregnancy interval will not have enough time to recover and get ready for the subsequent pregnancy. This includes physiological body preparedness, psychological, socio-economic and cultural. *Lilungulu A1, Matovelo D1, Kihunrwa A2, Gumodoka B2. (2015)*

short and long IPIs were allied with adverse pregnancy outcomes. The short IPIs were accompanying with increased risk of prematurity and LBW, and long IPIs were allied with increased risk of still birth and PIH *(Mahfouz.et al., 2018).* The findings of the previous studies suggesting that both the mother and subsequent child are more risk to suffer adverse consequences in the short- long-term and if the birth interval is less than twenty four months. Not only the short birth-to-pregnancy (BTP) intervals associated with negative perinatal outcomes, but so the long BTP intervals of fifty nine months or more *(WHO 2005).*

Women with a short inter pregnancy interval (SIPI) naturally defined as less than eighteen months have a greater chance of adverse obstetric outcomes, with those conceiving at an interval less than six months at highest risk for spontaneous preterm birth, preterm premature rupture of membranes, small for gestational age infants, fetal demise and congenital anomalies *(Andrew S. et al., 2018)* . Short interpregnancy spaces have been linked to increase the risk for low birth weight, small gestational age (SGA), preterm birth, dystocia and maternal morbidity and mortality. Early neonatal death, which attributes to most perinatal death, is caused by low birth weight and preterm birth. Stillbirth accounts to be 74% of all perinatal deaths *(Ragab, Abd-El-Hamid, Heiba, El-alem., (2015)*

The impact of SIPI is greater in very young aged women; this is because young adolescent who is still growing, may compete with the fetus for nutrients *Ekow EE, Moawad A., (1998*). Pregnant women with SIPI have increased risk of uterine rupture, placenta Previa, placenta abruption, and perinatal infections *Shipp TD, Zelop CM, Repke JT, Cohen A, Lieberman E., (2001)*. Short IPI may increase the risk of maternal obesity due to possible cumulative significant weight changes in between pregnancies due to pregnancy weight retention. A Swedish cohort study found that an inter-pregnancy weight gain of 1–2 body mass index (BMI) units during an average of two years increases the risk of weight-related diseases, gestational hypertension and diabetes by 20–40%. *(Iheukwumere CB., et al., 2016).* Inter-pregnancy interval shorter than six months after delivery of a live single baby may be a leading risk factor for induced abortion and still birth, because the uterus needs time to recover after a previous pregnancy *(Ragab, Abd-El-Hamid, Heiba, El-alem., (2015).*While women with a Long inter-pregnancy intervals (LIPI) are autonomously associated with an increased risk of pre-eclampsia. Both short and long inter-pregnancy intervals seem to be related to other passive maternal outcomes, but more research is needed. *Andrew et al., (2018).* While *Dewey KG, &Cohen RJ., (2007)* believed that, Long intervals presumed to be a consequence of infecundity and its associated poor pregnancy outcomes. Long IPI is a significant risk factor for low birthweight and preterm labor. Health care providers need to pay close attention to preterm delivery prevention and fetal growth during prenatal care for second pregnancies where the mothers have long IPIs *QinC., et al., (2017).*

Significance of the study:

Birth interval offers a great possible in protecting the health position of the mothers, and improving outcome of the following pregnancy. In addition to, it is an important determinant of the rates of population growth and socio-economic status of the communities *siugo-Abanihe UC,et al., (2008).* Studies have shown higher burden of maternal and child mortality in the developing countries and there is limited information regarding the effect of SIPI on maternal and fetal adverse outcome *Exavery A, Mrema S, Shamte A, Bietsch K, Mosha D, Mbaruku G, Masanja H ., (2012)* .

Several studies found that, short and long intervals between pregnancies are associated with an increased risk of several negative pregnancy outcomes such as maternal anemia, preterm delivery, small for gestational age, and rupture of the uterus. However, most of the researches in this area has focused on antenatal outcomes while, the effects of birth spacing on maternal-fetal health and mortality has received less studiousness *(Conde-Agudelo, Rosas-Bermudez, Castao, & Norton, 2012).*

Both short and long IPI are important risk factors for negative pregnancy outcomes. These results intensify the importance of providing support for family planning programs which will encourage optimal IPI and improve pregnancy outcomes. *(Mahande,j,M., & Obure,j.,(2016).* IPIs (inter pregnancy intervals) of <18 months and >5 years are associated with increased risk of poor fetal and maternal outcome *Sholapurkar SL., (2010)*. In addition to the most of these poor

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obstetrical outcomes are preventable. As a result of delayed the   age of marriage   up to 35 years or more in Egypt, this was a corner cause to increase the short inter- pregnancy intervals among pregnancy times which due to negative impact on maternal physiological health as well as psychological health. So, all maternity nurses in all antenatal and gynecological clinics must be knowledgeable about inter-pregnancy interval and its effect on pregnancy outcome. In other words, Supporting women in attaining recommended inter-pregnancy intervals is a significant maternal-child health nurse concern because of short inter-pregnancy intervals are accompanying with negative perinatal, neonatal, infant, and maternal health outcomes *(Sridhar, A., Salcedo,j.,2017)*.

So, Researchers are interesting in studying the impact of inter-pregnancy interval on obstetrical and psychological complications among women in the reproductive age.

Purpose of the Study: To identify the impact of inter-pregnancy interval on obstetrical and psychological complications among women in the reproductive age.

Research Questions:

✓   What are the causes of short pregnancy interval?

✓   What are the adverse effects of short inter-pregnancy interval on obstetrical and psychological complications among women in the reproductive age?

✓   What are the causes of long pregnancy interval?

✓   What are the adverse effects of long inter-pregnancy interval on obstetrical and Psychological Complications among women in the reproductive age?

II.   SUBJECTS AND METHODS

Research Design:

Cross-sectional design was used for this study. Cross-sectional study design is a type of remarking study design. In a cross-sectional study, the researcher measures the outcomes and the exposures in the study participants at the same time. the participants in a cross-sectional study are selected based on the inclusion and exclusion criteria set for the study sample *(Setia ,2016)*.

Settings:

The present study conducted at Obstetrics and gynecology departments at two hospitals (University hospital at Shebein, and Shebein El-Kom Teaching hospitals), Menoufia Governorate, Egypt. They were selected as they are big hospitals located in urban dense population areas and also, serve some of the small rural communities surrounding the city with a high rate of women seeking delivery. The average daily flow for delivery seeking service in any of the two hospitals ranged from 5 to 10 pregnant women daily.

Sample and Sampling Technique:

A purposive sample of (200) women during post-partum period. The researchers selected the women who met the following **inclusion criteria**: Including women in child bearing period, had previous pregnancy or abortion, with short or long inter-pregnancy interval, women during post-partum period with single newborn, had no history of obstetrical and psychological complications, and agree to participate in this study. While **the exclusion criteria** were primipara women, who had history of obstetrical and psychological problems, complain from infertility.

The sample size: The sample size was calculated using the following equation *Ambe et al., (2010).*

$$n = \frac{(Z^2 p \times q)}{e^2}$$

n = sample size

z = z value for 99%. = 2.57

p (prevalence) = 0.5

q = (1-p) = (1- 0.50)

e = margin of error= 0.10

n= $(2.57)^2 \times 0.50 \times (1-0.50) \div (0.10)^2 = 165$

The researchers added 35 cases (20% of sample size) to the total sample size to overcome any withdrawn cases during collection of data, and to complete total cases to two hundred women.

Instruments of Data Collection:

Three instruments for data collection were developed by the researchers after a review of the past and current literature and used to collect the data by the researchers as the following:

Instrument I.: An interviewing questionnaire: This instrument was developed and used by the researchers after extensive literature review and it included four parts:

Part one: **Socio- demographic characteristics** of the studied women. Which included age, educational level of women and her husband, type of occupation for women and her husband, and site of residence.

Part two: **Reproductive history** of the previous pregnancies and deliveries of the women. It included, gravida, para, numbers of abortion, causes of abortion, previous inter-pregnancy and deliveries spaces, types of previous deliveries, and causes of short and long inter-pregnancy spaces/ intervals.

Part three: **Women's obstetrical complications during pregnancy, labor, and postpartum period.**

It is divided into three sub-parts: **first**; about the obstetrical complications during pregnancy such as abortion, gestational diabetes, anemia, pre-eclampsia, pregnancy induced hypertension, and vaginal bleeding. **Second**; about the obstetrical complications during labor such as preterm and post-term labor, prolonged and obstructed labor, PROM, antepartum hemorrhage, fetal & maternal distress, failure of normal vaginal delivery after C.S, still birth, small for gestational age. **Third**, about the obstetrical complications during puerperium such as subinvolution of the uterus, PPH, perineal laceration, floppy uterus, and hospital stay more than 72 hours.

Part four: **Women's psychological complications after delivery**

It consisted of nine questions answered by yes or no. These questions about the psychological complications of the women after delivery, such as sense of guilt, sense of loss of control, loss of self-esteem/respect, sense of pressured and irritability, anxiety about maternal health, feeling of anxiety, post-partum depression (blues), fear of transferring of hereditary diseases to the baby, and finally anxiety about newborn heath. If the woman felt it, she takes code 1(Yes). If she not, she takes code 2 (No)

Instrument II: Generalized Anxiety Disorder (GAD-7) questionnaire):

It is developed by *Spitzer et al (2006)*, and translated into Arabic by the researchers. It consisted of seven questions. The **G**eneralized **A**nxiety **D**isorder **(GAD-7)** questionnaire is a self-report anxiety questionnaire designed to assess the mother's psychological health status for anxiety during the previous two weeks. It consisted of seven items, these items enquire about the degree to which the mother has been bothered by feeling nervous, anxious or on edge, not being able to stop or control worrying, worrying too much about different things, having trouble relaxing, being so restless that it is hard to sit still, becoming easily annoyed or irritable and feeling afraid as if something might happen. It is completed after six weeks after delivery. It is like Likert scale; the total score of anxiety was twenty-one degrees. Each (feeling) which the woman felt she expressed on it by the following:

had (zero) in case of not feeling, degree (1) in case of the woman felt it several days, degree (2) in case of the woman felt it in more than half days, and degree (3) in case of the woman felt it nearly every day. The degree of the total score was divided into four categories as follows(scoring system):

➢ *None:* when the score less than 5.

➢ *Mild:* when the score from 5- 9

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➢ *Moderate:* when the score from 10-14.

➢ *Severe:* when the score from 15- 21.

Instrument III: PHQ-9 DEPRESSION SCALE:

The PHQ-9 is the nine-item depression scale of the patient health questionnaire. It is developed by *Spitzer et al (2006)* and translated into Arabic by the researchers. It is one of the most validated tools in the mental health and it is a powerful tool to assist clinicians with diagnosing postpartum depression and monitoring treatment response. The nine items of the PHQ-9 are based directly on the nine diagnostic criteria for major depressive disorder in the DSM-IV. The nine items cover the experience of pleasure, feeling down, sleep disruption, energy levels, appetite, feeling a self-failure, trouble concentrating, speaking slowly or being fidgety and having negative thoughts around suicide or self-harm over the previous two weeks. It is completed after six weeks after delivery. It is like Likert scale; the total score of depression was twenty-seven degrees. Each (feeling) which the woman felt she expressed on it by the following:

had (zero) in case of not feeling, degree (1) in case of the woman felt it several days, degree (2) in case of the woman felt it in more than half days, and degree (3) in case of the woman felt it nearly every day.

The degree of the total score was divided into five categories as follows(scoring system):

➢ *None:* when the score less than 4.

➢ *Mild:* when the score from 5- 9

➢ *Moderate:* when the score from 10-14.

➢ *Moderately severe:* when the score from 15- 19.

➢ *Severe:* when the score from 20- 27.

Reliability of the instruments:

The reliability of the instrument was conducted to investigate the instrument internal consistency which used in the study. Internal consistency describes the extent to which all the questionnaire items measure the same concept or construct. Cronbach alpha coefficients were calculated to examine the measurement reliability with multipoint items. The accepted values of Cronbach alpha coefficient range from 0.60 to 0.95. *Sun et al (2007), Tavakol, and Dennick (2011)* The questionnaire items of the present study were proven reliable where α = 0.91

Validity of the instruments:

Instruments were reviewed by five experts in the field of maternity health nursing, pediatric health nursing and psychiatric health nursing (Two pediatric health nursing experts, two experts in maternity and newborn health nursing, and one expert in psychiatric health nursing.)

Pilot Study:

It was conducted on 10 % of the total participants according to the selection criteria. All women participated in the pilot study excluded from the study sample. Based on the results of the pilot study and expert's opinion, modifications and omissions of some details were done.

Ethical consideration

An official permission to carry out the study was obtained from the director of each setting after submitting an official letter from the Dean of the Faculty of Nursing at EL- Menoufia University and Vice Dean for post graduates studies and researches explaining the purposes of the study and methods of the data collection.

Procedure:

This study was carried out through **three consecutive phases:** interviewing & assessment phase, implementation phase and evaluation phase. Data was collected in six months from the start of November 2018 to the end of April 2019**.** The researchers were attended to the previous mentioned hospital four times per week.

Interviewing & assessment phase:

Postpartum women were interviewed in a private room in the workplace of the nursing professionals, the researchers introduced themselves to each woman to give her trust. Explanation about the purposes and methods of the data collection

was provided by the researchers to gain their consent. oral consent was obtained from each woman. The researchers collected demographic data, reproductive and obstetrical history, obstetrical and psychological complications during pregnancy and delivery of the women in the hospitals were obtained by the interviewing questionnaire and women's obstetrical complications during pregnancy, labor, and puerperium.

Implementation phase:

The researchers calculated the duration between the last delivery of a live birth and the next conception. The researchers divided the women into two groups according to IPI duration to the short and long IPI. Short IPI group divided into three categories according to the calculated duration (less than a year, a year, and less than two years). Long IPI divided into three categories according to the calculated duration (from 4-7 years, from 8-10 years, and more than 10 years).

Maternal and fetal complications during labor were checked, then the postpartum hemorrhage had monitored by observing the amount of blood loss in the pads and measuring the vital signs. Uterine contraction and fundal level had been assessed to assess the contractility of the uterus after delivery. The quality of breast feeding was observed. Vital signs and measurements were checked for the newborn to detect any abnormalities. Neonatal complications were monitored such as preterm and post-term labor, LBW, stillbirth, and early neonatal death.

Evaluation phase:

After six weeks postpartum, the researchers completed the collection of the data about postpartum and psychological complications by using tele-nursing communication with women for completing the Generalized Anxiety Disorder questionnaire (GAD-7) and PHQ-9 Depression Scale, and late postpartum complications such as secondary PPH and subinvolution of the uterus. The researchers also had been made electronic questionnaire and had been sent to the women by using tele-nursing communication to collect these data.

Statistical Analysis:

All statistical analyses were done using (SPSS version 22). Initially, the internal consistency coefficients were examined to ensure the reliability of the used instrument for the present samples. Frequencies, means, and standard deviations were calculated to describe the sample. chi-square test (X^2) was used to compare the obstetrical and psychological complications between short and long IPI groups among participated women. Statistical significance was considered at **p-value <0.05**.

III.   RESULTS

The result of the study is divided into three parts as the following:

Part 1: Demographic, obstetrical data and reproductive history.

Part 2: Obstetrical complications during pregnancy, labor, and puerperium.

Part 3: Psychological complications of the studied sample.

Part 1: Demographic, obstetrical data and reproductive history

Table (1): Showed that the demographic characteristics of the studied sample, which 58.5% had aged from 36 to 50 years old of the studied sample. 77% had university education of the studied sample and 86% of women had working (while 14% were housewives). Also, 47% of the husband had university education and 60% of them were employee. Regarding to residence 74.5% were urban.

Figure(1): Clarified that 58.5% had aged from 36 to 50 years old of the studied sample.

Figure(2): Clarified that 86% were working and 14% were housewives of the studied sample.

Table (2) Illustrated the obstetrical history of the studied sample, the most gravida were more than five with 43% and the para were five with 28.4%. 48% of the studied sample had history of abortion, while 28.5% were unknown causes of abortion. The most duration between the last abortion and the next pregnancy were from 2 to 6 months with 17.5% . The most type of delivery among women of the studied sample were normal vaginal delivery with 57% , while cesarean section were 39.5%.

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Figure(3): Clarified that 57% were normal deliveries, 39.5% were cesarean section, and 3.5% were instrumental delivery of the studied sample.

Table (3): Illustrated the interpregnancy interval (IPI) between the last delivery and the next pregnancy among the studied sample. 37% had IPI less than two years, while 40% had IPI with 4-8 years.

Figure(4): Clarified that 55.5% had short IPI and 44.5% had long IPI among women of the studied sample.

Table(4): Indicated the causes of short IPI among women of the studied sample. The most causes were the husband desire and not using any contraception methods with 26.5% and 25.7% respectively.

Table(5): Indicated the causes of long IPI among the studied sample. The most cause was the wife desire with 24.5%.

Part 2: Obstetrical complications during pregnancy, labor, and puerperium

Table(6): Illustrated the pregnancy complications among mothers of the studied sample. there were highly statistically significant differences between the short IPI and long IPI regarding to obstetrical complications during pregnancy(p< 0.001). In the short IPI group, the women experienced abortion more than women in the long IPI group (18.9% against 1.12%), gestational diabetes occurred more in the Short IPI (25.2%). Anemia and pregnancy induced hypertension occurred more in Long IPI with 44.9% and 7.8% respectively.

Figure(5): Clarified pregnancy complications of short and long IPI. 25.2% had gestational diabetes in the short IPI and 44.9% had anemia in the long IPI.

Table(7): Illustrated the labor complications among mothers of the studied sample, there were statistically significant differences between the short IPI and long IPI regarding to obstetrical complications during labor (p<0.05). The mothers in the short IPI experienced preterm labor which result in premature baby and post-term labor more than mothers of long IPI (21.6%, 21.6%, 23.4%) respectively. The mothers in the long IPI group suffered stillbirth more than in the short IPI group (23.5%).

Figure(6): Clarified labor complications of the short and long IPI. 21.6% of mothers in the short IPI group experienced preterm labor and 23.5% of mothers in the long IPI group experienced stillbirth.

Table(8): Illustrated the postpartum complications among mothers of the studied sample. There were statistically significant differences between the short IPI and long IPI regarding to obstetrical complications during postpartum (p<0.05). The mothers in the short IPI experienced floppy uterus more than mothers in the long IPI (21.6%). 49.4% of mothers of the long IPI stay in the hospital more than 72 hours after delivery.

Figure(7): clarified the Postpartum complications of short and long IPI. 21.6% had floppy uterus in the short IPI and 49.4% had hospital stay more than 72 hours after delivery in the long IPI.

Part 3: Psychological complications of the studied sample

Table (9): Indicated the psychological complications among mothers of the studied sample. There were statistically significant differences between the short IPI and long IPI regarding to psychological complications (p<0.05). Both groups experienced anxiety and depression after delivery. 63.1% of mothers in the short IPI suffered anxiety about congenital anomalies of the newborn and the same percentage for anxiety about health status of the newborn. 24.3% had sense of anxiety and 41.4% had sense of depression among mothers in the short IPI.

Table (10): Indicated the anxiety severity among mothers of the studied sample. None with 44%, mild with 27.9%, moderate with 23.4%, and severe with 2.7% in the short IPI group. None with 41.5%, mild with 25.8%, moderate with 21.3%, and severe with 11.2% in the long IPI group.

Figure(8): clarified the anxiety severity among mothers of the studied sample. 27.9% had mild degree of anxiety in the short IPI group. 25.8% had mild degree of anxiety in the long IPI group.

Table (11): Indicated the depression severity among mothers of the studied sample. None with 34.2%, mild with 34.2%, moderate with 15.3%, moderately severe with 14.4%, and severe 1.8% in the short IPI group. None with 37%, mild with 38.2%, moderate with 22.4%, moderately severe with 2.24%, and severe 0% in the long IPI group.

Figure(9): Clarified the depression severity among mothers of the studied sample. 34.2% had mild depression in the short IPI group.38.2% had mild depression in the long IPI group.

Part 1: Demographic, obstetrical data and reproductive history:

<p align="center">Table (1): Demographic characteristics of the studied sample (n=200).</p>

| Items	(N= 200)	
	Frequency	**Percent%**
Age:		
- 20-25 years.	**5**	**2.5 %**
- 26-30 years.	**25**	**12.5 %**
- 31-35 years.	**36**	**18 %**
- 36-50 years.	**117**	**58.5 %**
- >50 years.	**17**	**8.5 %**
Mean ±SD	**36.5 ± 5.7**	
Educational level:		4 %
-Illiterate	8	5.5 %
Read &write	11	13 %
Secondary	26	77 %
University	154	0.5 %
Postgraduate	1	
Women's occupation:		
Working	172	86 %
Not working	28	14 %
Women's Residence:		
Rural	51	25.5 %
Urban	149	74.5 %
Husband occupation:		
Worker	15	7.5 %
Employee	120	60 %
Teacher	26	13 %
Private work	36	18 %
Physician	3	1 %
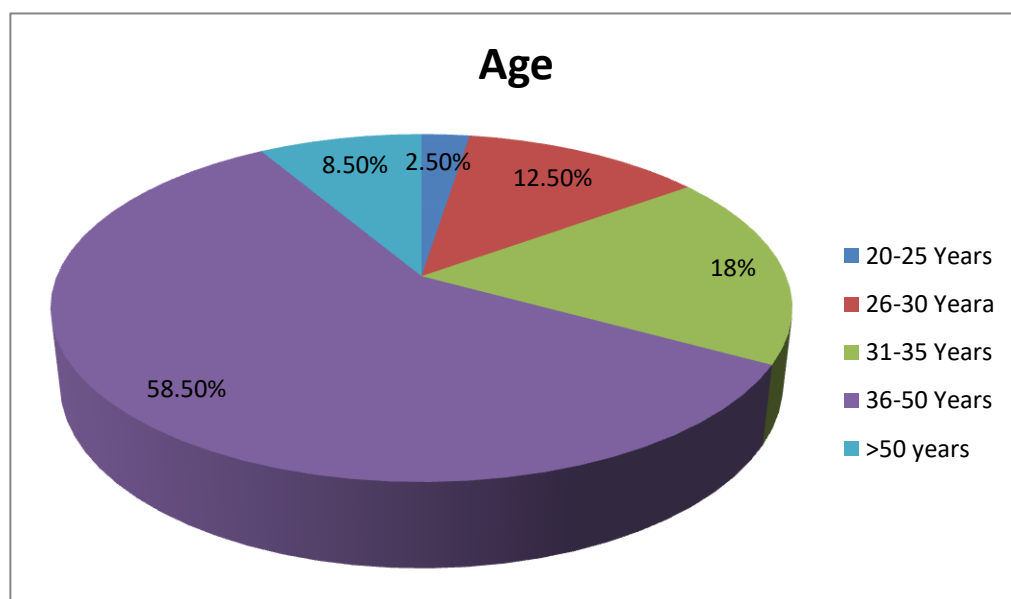
<p align="center">Figure (1): Distribution of age categories among the studied sample.</p>

58.5% had aged from 36 to 50 years old of the studied sample
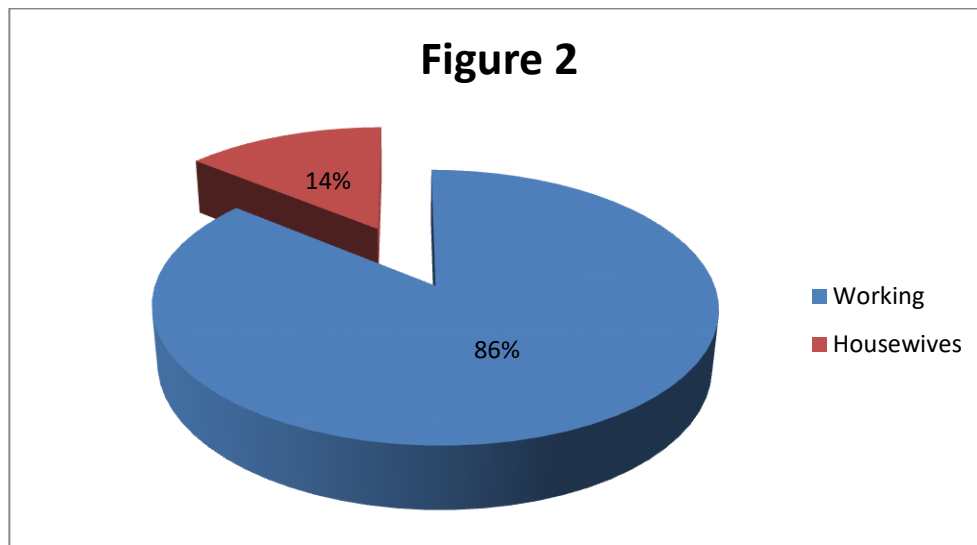
Figure (2): Distribution of working condition among the studied sample.

86% were working and 14% were housewives of the studied sample.

Table (2): Reproductive history of the studied sample (n=200).

| Items	(N= 200)	
	Frequency	**Percent%**
Gravida		
2	27	13.5 %
3	20	10 %
4	30	15 %
5	37	18.5 %
>5	86	43 %
Para		
2	35	17.5 %
3	28	14 %
4	40	20 %
5	57	28.4 %
>5	40	20 %
No. of abortion		
None	104	52 %
1	53	26.5 %
2	14	7 %
3	14	7 %
>3	15	7.5 %
Causes of abortion (n= 96):		
Unknown	56	28 %
There was no suitable IPI	17	8.5 %
None using family planning methods	19	9.5 %
Maternal disease	3	1.5 %
Fetal congenital abnormalities	1	0.5 %
Duration between last abortion& the next pregnancy(n=96):		
2-6 months	35	17.5 %
7-12 months	29	14.5 %
1-4 years	27	13.5 %
≥ 5 years	5	2.5 %
Type of delivery:		
Normal	114	57 %
Instrumental delivery	7	3.5 %
C.S	79	39.5 %

Page | 1633
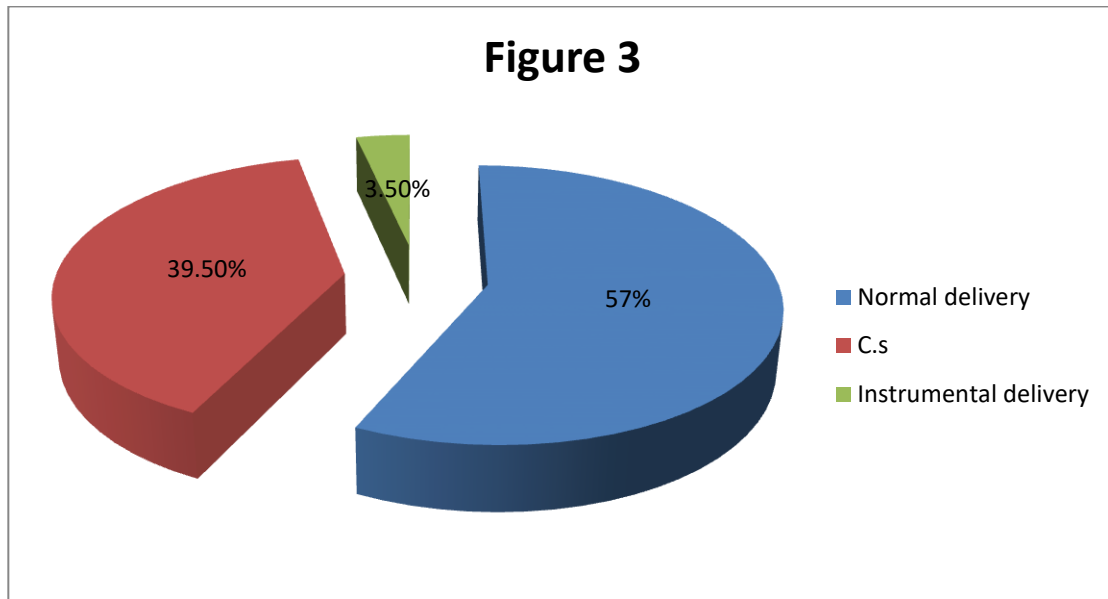
Figure (3): Distribution of the types of delivery among the studied sample.

57% normal deliveries, 39.5% cesarean section, and 3.5% instrumental delivery of the studied sample

Table (3): Duration of the last Inter-pregnancy interval among the studied sample (N= 200)

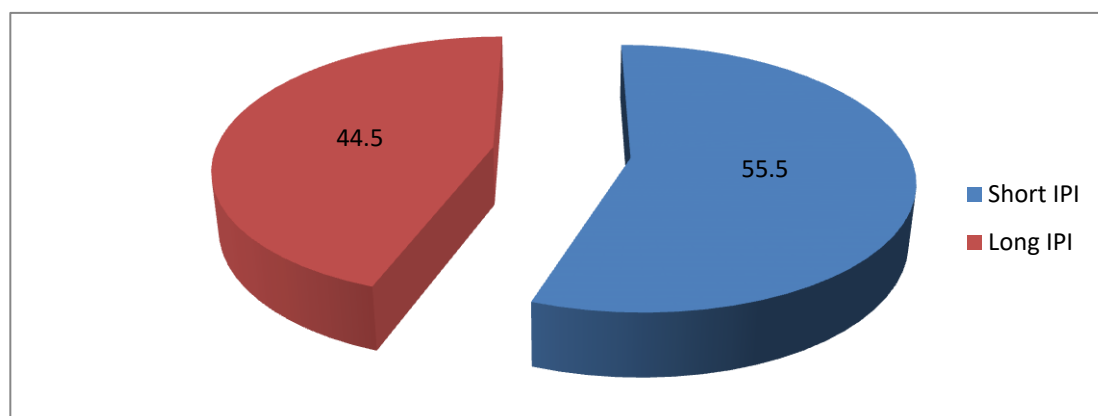| Duration:	(N= 200)	
	Frequency	**%**
Short IPI:		
-Less than a year.	9	4.5 %
- A year.	28	14 %
- Less than two years.	74	37 %
Total short IPI	111	55.5%
Long IPI:		
- 4-7 years.	80	40 %
- 8-10 years.	7	3.5 %
- More than 10 years.	2	1 %
Total long IPI	89	44.5%
Total	200	100.0

Figure (4): Distribution of short and long IPI among the studied sample.

55.5% had short IPI and 44.5% had long IPI of the studied sample

Table (4): Causes of short IPI among the studied sample (N= 111)

Causes of short IPI:	short IPI (111)	
	F	**%**
1. Husband desire.	30	27
2. Wife desire.	13	11.7
3. Husband Family desire.	4	3.6
4. Seek for male gender.	15	13.5
5. Not using contraception methods.	29	26.12
6. Pregnancy occurs during using contraception.	20	18
Total	111	100%

Table (5): Causes of long IPI among the studied sample (N= 89)

Causes of long IPI:	long IPI (89)	
	F	**%**
Causes:		
1. Husband desire.	6	6.7
2. Wife desire.	38	42.7
3. Natural.	23	25.8
4. Health problems of the mother.	12	13.4
5. Husband and wife desire.	8	9
6. Congenital abnormalities of the fetus.	2	2.24
Total	89	100%

Part 2: Obstetrical complications during pregnancy, labor, and puerperium

Table (6): Pregnancy complications of short and long inter-pregnancy interval among the studied sample

Obstetric complications	Short IPI (n= 111)		Long IPI (n= 89)		X^2	P-value
	F	**%**	**F**	**%**		
Complications During pregnancy:						
- Abortion.	21	18.9	1	1.12		
- Gestational diabetes.	28	25.2	14	15.7		
- Anemia.	35	31.5	40	44.9		
- Preeclampsia.	3	2.7	2	2.24		
- Pregnancy induced hypertension.	3	2.7	7	7.8	X^2= 26.02	p.= 0.000*
- Antepartum hemorrhage.	9	8.1	5	5.6		
- None	12	10.8	20	22.47		
Total =	111		89			

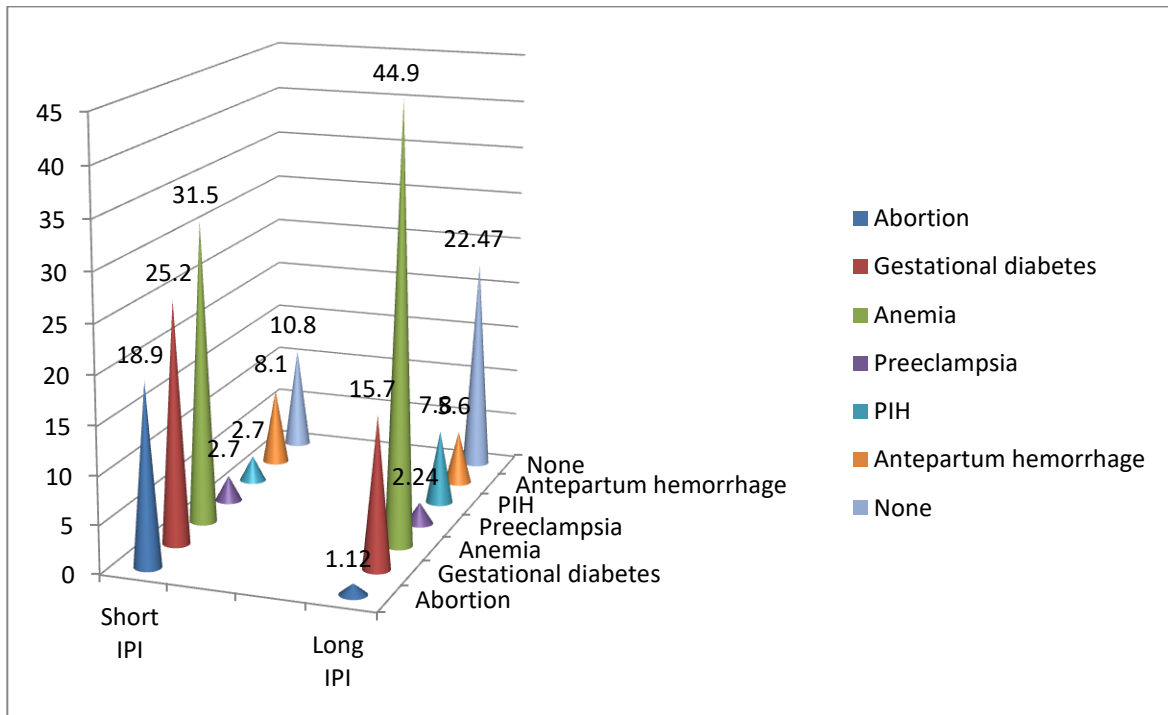**** Highly statistically significant at p< 0.001**

Figure (5): Pregnancy complications of short and long IPI. 25.2% had gestational diabetes among short IPI. 44.9% had anemia among long IPI.

Table (7): Labor complications of short and long inter-pregnancy interval among the studied sample

Obstetric complications	Short IPI (n= 111)		Long IPI (n= 89)		X^2	P-value
	F	%	F	%		
Complications During labor:						
- Preterm labor.	24	21.6	8	8.9		
- Post-term labor.	26	23.4	11	12.3		
- Prolonged labor.	5	4.5	6	6.7		
- Obstructed labor.	6	5.4	4	4.4		
- PROM.	10	9	10	11.2		
- Antepartum hemorrhage.	7	6.3	8	8.9		
- High risk mother.	2	1.8	4	4.4	$X^2=$ 22.62	P.= 0.03*
- High risk baby.	4	3.6	5	5.6		
- Failure vaginal delivery after C.S.	3	2.7	3	3.3		
- LBW.	1	0.9	3	3.3		
- Premature baby.	24	21.6	8	8.9		
- Abnormal physical measurements of newborn.	1	0.9	2	2.2		
- Still birth.	1	0.9	21	23.5		
- None.	21	18.9	0.0	0.0		
Total	111		89			

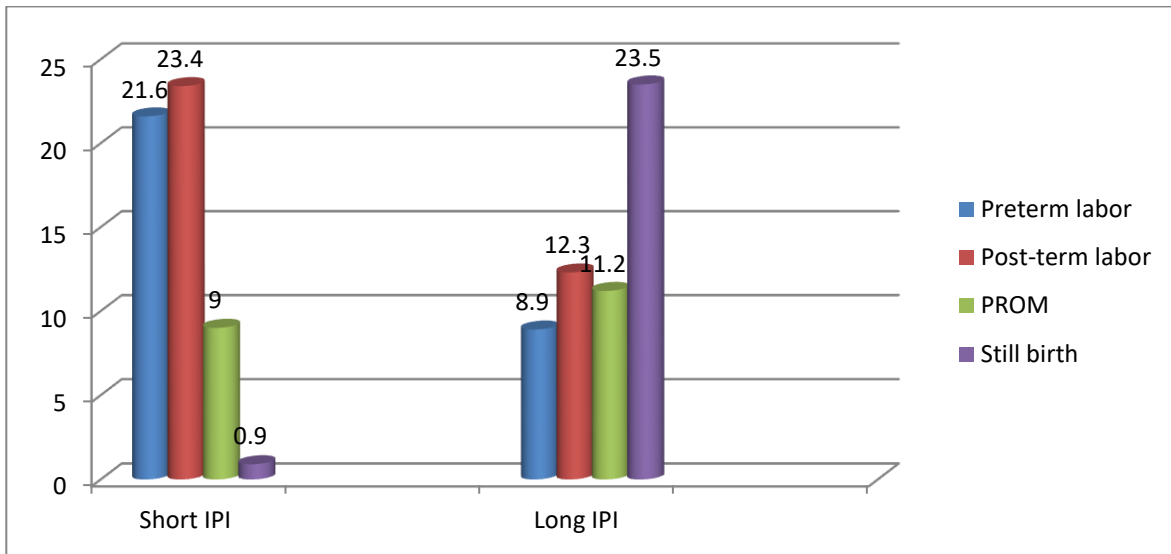*** Statistically significant at p <0.05**

Figure (6): Labor complications of short and long IPI

32.4% had post-term labor among short IPI. 23.5% had stillbirth among long IPI.

Table (8): Puerperium complications of short and long inter-pregnancy interval among the studied sample

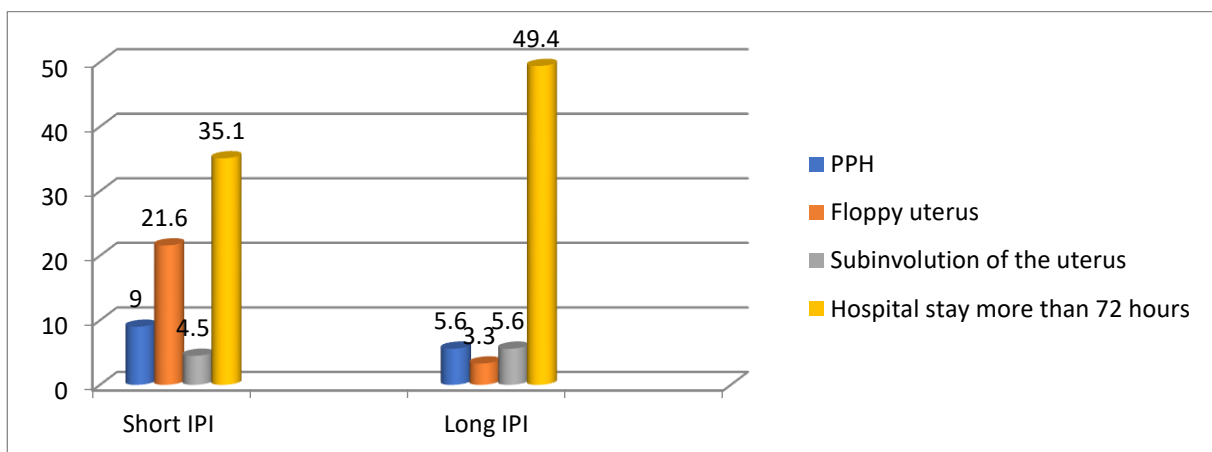| Obstetric complications:	Short IPI (n= 111)		Long IPI (n= 89)		X^2	P-value
	F	%	F	%		
Complications During post- partum:						
- PPH.	10	9	5	5.6		
- Floppy uterus.	24	21.6	3	3.3		
- Puerperal sepsis.	3	2.7	3	3.3	$X^2=$ 17.44	p.= 0.01[*]
- Subinvolution of the uterus.	5	4.5	5	5.6		
- Perineal laceration.	1	0.9	2	2.24		
- Hospital stay more than 72 hours.	39	35.1	44	49.4		
- None.	28	25.2	27	30.3		
Total	111	100%	89	100%		

* Statistically significant at p <0.05

Figure (7): Puerperium complications of short and long IPI

21.6% had floppy uterus in the short IPI and 49.4% had hospital stay more than 72 hours after delivery in the long IPI

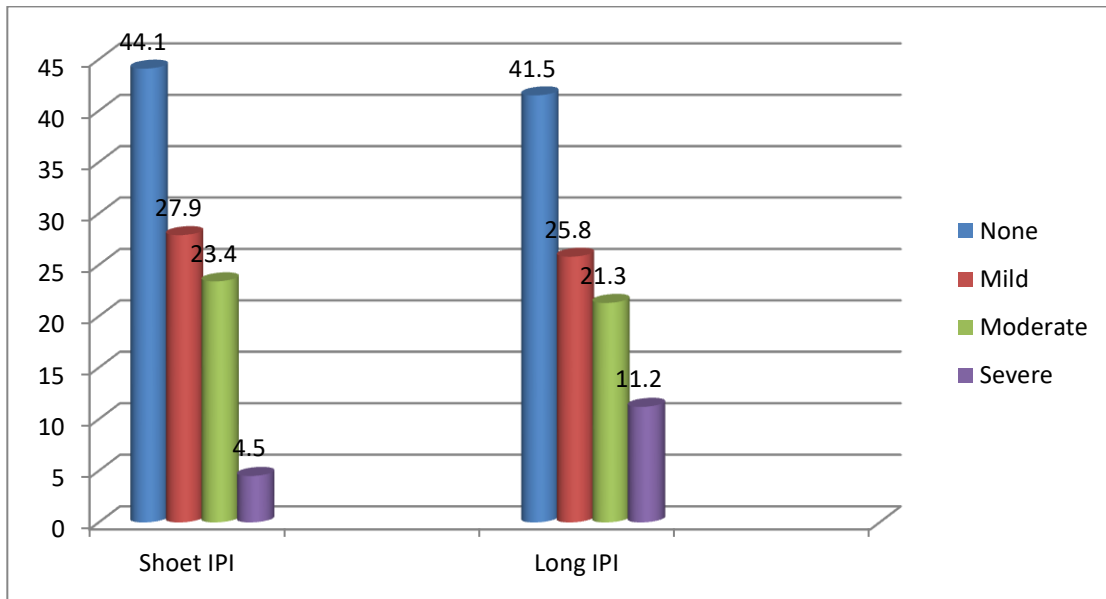**Part 3: Psychological complications of the studied sample**

Table (9): Psychological complications of the studied sample (N= 200)

Psychological complications:	Short IPI (n= 111)		Long IPI (n= 89)		X^2	P-value
	F	%	F	%		
- **Sense of guilt.** Yes. No.	17 94	15.3 84.6	11 78	12.3 87.6	X^2= 1.19	p.= 0.5
- **Loss of control.** Yes. No	17 94	15.3 84.6	11 78	12.3 87.6	X2= 0.35	p.= 0.5
- **Loss of self-respect.** Yes. No	13 98	11.7 88.2	2 87	2.2 97.7	X2= 6.37	p.= 0.012*
- **Sense of pressured and irritability.** Yes. No	54 57	48.6 51.3	37 52	41.5 58.4	X2= 0.9	p.= 0.19
- **anxiety about your health.** Yes. No	61 50	54.9 45.1	47 42	54.8 47.2	X2= 0.09	p.= 0.7
- **Anxiety about congenital disease of the newborn.** Yes. No	70 41	63.1 36.9	43 46	48.3 51.7	X2= 4.3	p.= 0.03*
- **Anxiety about health status of the newborn.** Yes. No	70 41	63.1 36.9	40 49	44.9 55.1	X2= 6.5	p.= 0.01*
- **Sense of anxiety.** Yes. No	27 84	24.3 75.6	13 76	14.6 85.4	X2= 2.9	p.= 0.08*
- **Sense of depression.** Yes. No	46 65	41.4 58.5	23 66	25.9 74.1	X2= 5.3	p.= 0.02*
Total	**111**	**100%**	**89**	**100%**		

* Statistically significant at p <0.05

Table (10): Anxiety severity among the studied sample of the studied sample (N= 200)

Anxiety severity scores:	Short IPI (n= 111)		Long IPI (n= 89)		X^2	P-value
	F	%	F	%		
Anxiety severity scores: - None - Mild - Moderate - Severe	49 31 26 5	44.1 27.9 23.4 4.5	37 23 19 10	41.5 25.8 21.3 11.2	X^2= 7.38	p.= 0.1
Total	**111**	**100%**	**89**	**100%**		

Figure(8): The anxiety severity among mothers of the studied sample.

27.9% had mild degree of anxiety in the short IPI group. 25.8% had mild degree of anxiety in the long IPI group.

Table (11): Depression severity among the studied sample (N= 200)

Depression severity	Short IPI (n= 111)		Long IPI (n= 89)		X^2	P-value
	F	%	F	%		
Depression severity scores:						
- None	38	34.2	33	37		
- Mild	38	34.2	34	38.2		
- Moderate	17	15.3	20	22.4	X^2= 11.4	p.= 0.02*
- Moderately severe	16	14.41	2	2.24		
- Severe	2	1.8	0.0	0.0		
Total	**111**		**89**			

* Statistically significant at p <0.05
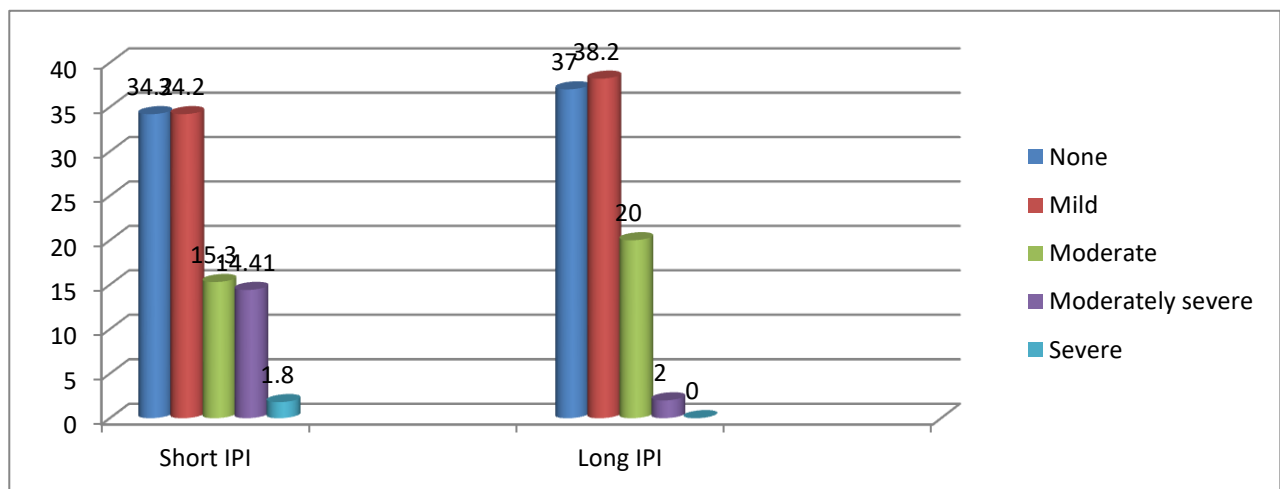
Figure (9): The depression severity among mothers of the studied sample.

34.2% had mild degree depression in the short IPI group.38.2% had mild degree depression in the long IPI group.

IV. DISCUSSION

This study has illustrated a very clear higher risk for maternal and neonatal adverse outcomes among women with short and long inter-pregnancy interval. This is because short inter-pregnancy interval women will not have sufficient time to recover in terms of psychological and physiological body preparedness and get ready for the subsequent pregnancy. In the long IPI, there were many obstetrical complications for the mother, fetal, and newborn such as anemia and stillbirth. This is because the long IPI became like Primigravidas women with all high-risk pregnancy besides the mothers became old age.

Regarding to obstetrical complications during pregnancy

The study results showed that there were highly statistically significant differences between the short IPI and long IPI regarding to obstetrical complications during pregnancy (p<0.001). In the short IPI group, near to twenty percent of women experienced abortion compared by only two percent of women in the long IPI group. This findings in congruent with study of *Kabano et al (2015)* in Rwanda, which illustrated that both short IPI and long IPI experienced early fetal loss.

In addition, the study showed increased risk for gestational diabetes (one quarter of women with a short IPI, while only fifteen percent of women with long IPI complained of gestational diabetes, this findings in accordance with study of *Mahande and Obure (2016)*, which indicated that short IPI suffered gestational diabetes more than long IPI. On the same line *Hanley et al(2017)* also indicated that short IPI were significantly associated with increased risk of gestational diabetes during pregnancy. Also, anemia was prominently seen among women in the reproductive age. Near to half of women with long IPI complained of anemia compared to near one third of women with short IPI. This finding was against to study done in Nigeria by *Nwizu et al (2011)*. This study illustrated that women with short IPI were more likely to have anemia during the course of their pregnancy than long IPI women. The both groups of the current study suffered from anemia, this may be related to maternal nutritional depletion and untreated anemia from the previous pregnancy which lead to iron deficiency anemia among these women.

Regarding to pre-eclampsia and pregnancy induced hypertension, the results of this study reported that less than one tenth of the women in short IPI agonized from pre-eclampsia and pregnancy induced hypertension, while in long IPI the percentage augmented to near to one tenth of women. This finding was parallel to the study done by *Conde Agudelo et al, (2006)* reported that both short and long IPI women were risk factors for pregnancy induced hypertension and pre-eclampsia. On the same line *Ngo et al, (2015)* indicated that both short and long inter-pregnancy intervals can be used as risk markers to identify women with an elevated cardiovascular disease risk later in life. The finding was against to study done by *Orji et al, (2004)*, which indicated that no statistically significant differences between short IPI and long IPI in perinatal complications.

Finally, regarding to antepartum hemorrhage, The current study results showed that near to one tenth of women with a short IPI compared to less than one tenth of women with a long IPI complained of bleeding during pregnancy, and durning the first stage of labor, this findings in accordance with the study of *Cecatti et al, (2008)*, which illustrated that the antepartum hemorrhage was a leading result from the short IPI.

Regarding to obstetrical complications during labor

The study results showed that, there were statistically significant differences between the short IPI and long IPI regarding to obstetrical complications during delivery (p<0.05). As results yielded by the present study, short IPI is an important risk factor for preterm delivery. These study findings supported by *Eleanor et al, (2010)* who were found that, pregnant women with an inter-pregnancy interval of less than six months were more liable to have preterm delivery. The present study findings were in disagreement with *Love et al, (2010)* who did not find any relation between short IPI and preterm deliveries.

From another point of view of *Abdel-Hamed, (2011)* who verified that more than half of the gravid women with short IPI had premature labor. As well as *Shachar and Lyell (2012)*; this may be due to anemia, malnutrition; all were predisposing factors for preterm labor.

Also, the study results showed that there were statistically significant differences between the short IPI and long IPI regarding to post-term labor (p<0.05). Women in the short IPI group suffered from post-term labor more than women in the long IPI group. This result was supported by *DeFranco et al, (2014)* which indicated that short IPI associated with post-term pregnancy.

In addition to the current study results, there was a statistically significant increase of early neonatal complications such as preterm birth and stillbirth among women with short IPI and long IPI respectively. These results are in agreement with *Hussaini et al, (2013)* who reported that there was an increased infant mortality due to preterm birth and stillbirth among women with short IPI and long IPI with statistically significant differences (P ≤0.05). This result was also in accordance with *Mahfouz et al. (2018)* which illustrated that prematurity and low birth weight were associated with short IPI and stillbirth and pregnancy induced hypertension were associated with long IPI. However, these findings congruent with *Howard et al (2013)* who stated that better neonatal outcomes occur when the mother does not conceive within nine months of a previous birth. In Sudan *Mahande and Obure, (2016)* also found that women who conceived after IPI of less than eighteen months were more likely to have preterm labor compared with those who conceived after of 18–30 months and they found also the risk of stillbirth occurred more with long IPI. Besides *Schummers et al, (2019)* found that short IPI was associated with stillbirth and preterm labor. On the other hand, *Love et al, (2010)* did not find any relationship between short IPI and increased risk for negative pregnancy outcomes such as preterm deliveries.

Preterm labor had been occurred more in short IPI due to nutritional depletion, anemia, and gestational diabetes; all were predisposing factors for preterm birth. It is believed that short IPI do not provide a woman with sufficient time to recover from the nutritional burden and stress of the previous pregnancy. Short IPI are associated with unresolved intrauterine inflammation which causes preterm delivery in the next pregnancy. In addition to Stillbirth had been occurred more in long IPI may be related to gestational diabetes, anemia, and pregnancy induced hypertension; all were predisposing factors for stillbirth.

Regarding to obstetrical complications during puerperium

The study results showed that there were statistically significant differences between the short IPI and long IPI regarding to obstetrical complications during puerperium (P ≤0.05). As the present study findings; it was observed that women with short IPI were more reliable to have floppy uterus by high percent (near to one quarter of the sample than long IPI. These finding were supported by *Lilungulu et al, (2013)* who were found that the risk of floppy uterus was only six percentage higher among Short IPI women compared to women of Long IPI which resulted in postpartum hemorrhage. this may be due to anemia and malnutrition; all were predisposing factors for floppy uterus or uncontracted uterus after delivery.

The results of the present study showed that both long IPI and short IPI experienced hospital stay more than (72 hours) with high percentage in both group, this result in the same line with *Cecatti et al, (2008)* which illustrated that both Short IPI and long IPI experienced many complications that need long hospital stay and required from mothers to stay more than seven days after delivery.

Regarding to psychological complications

The study findings showed that statistically significant differences between the two groups regarding to anxiety and depression(P ≤0.05). It was noted that short IPI experienced anxiety and depression more than long IPI. This result supported by *Schetter et al, (2016)* which illustrated that short IPI suffered anxiety and depression more than long IPI. On the same line *Young et al, (2018)* indicated that psychosocial problems were associated with unhealthy interpregnancy interval. These findings supported also by *Zhu, (2005)* which indicated that short and long IPI were associated with postpartum stress. also *Gong et al, (2012)* illustrated that women who had a history of abortion and an interpregnancy interval of less than six months had increased risk of anxiety and depression symptoms (p <0.05) after delivery.

V. CONCLUSION

Both short IPI and long IPI are important risk factors for adverse obstetrical and psychological effects on maternal, fetal, and neonatal outcomes. Short IPI was associated with abortion, gestational diabetes, anemia, preeclampsia, pregnancy induced hypertension, and antepartum hemorrhage, besides preterm labor, post-term labor and floppy uterus and prolonged hospital stay after delivery. Long IPI was associated with anemia, preeclampsia, pregnancy induced

hypertension, and antepartum hemorrhage besides stillbirth and prolonged hospital stay after delivery. Moreover, short and long IPI causes anxiety and depression after delivery as a psychological problem. So, both short IPI and long IPI were associated with many obstetrical and psychological complications for the mother, fetus, and newborn.

VI. RECOMMENDATIONS

The "results of the current study" emphasize the importance of providing support for family planning programs which will enhance optimal inter-pregnancy spaces and improve maternal, fetal, and neonatal outcomes. The nurses in the hospital and health centers should give counselling to the mothers about the complications of short IPI and long IPI and encourage the effective use of the family planning methods to achieve optimal maternal and neonatal health. Additionally, more research is needed to understand the relationship between interpregnancy interval and other health outcomes on the mothers and newborn and if there were differences between developing and developed countries.

List of abbreviations:

- IPI :Inter-pregnancy interval
- SIPI: Short inter-pregnancy interval
- LIPI: Long inter-pregnancy interval
- LBW: Low birth weight
- PPH: Postpartum hemorrhage
- PIH: Pregnancy induced hypertension
- PROM: Premature rupture of membrane
- BTP: Birth To Pregnancy
- SGA: Small for Gestational Age
- SPSS: Statistical package of social sciences

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