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Analyzing Fetal Outcomes Variability in Women with Short Inter-Pregnancy Intervals: A Cross-Sectional Study

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ABSTRACT

The optimal interpregnancy interval (IPI) of 18-23 months is crucial for a mother's health, preventing adverse perinatal outcomes. Short IPI, particularly in females with a history of Cesarean section opting for vaginal birth, is associated with a 2 to 3 times increased risk of uterine rupture and other major morbidities. **Objective:** To assess the frequency of various fetal outcomes in women with short inter-pregnancy intervals. **Methods:** The study employed a Non-probability Consecutive sampling technique over nine months, from September 28, 2020, to June 20, 2021, comprising 170 female subjects who met inclusion criteria and provided informed consent, parameters such as parity, gestational age, and details about previous births were investigated. Presenting complaints were recorded using data collection proforma. The assessments included a thorough physical examination, per abdomen evaluation based on gestational age, and vaginal examination. **Results:** Maternal age data were analyzed using SPSS version 21.0 categorized into four groups, with mean age of 30 ± 1.27. Gravidity status was divided into three categories: 77.65% were multigravida, 18.82% were grand multigravida, and 3.53% were great grand multigravida among patients. Notably, 32.35% of females experienced preterm premature rupture of membranes, 38.82% had neonates born preterm, 12.35% suffered early neonatal death, and 25.29% had newborns with less weight at birth. **Conclusions:** The research concluded that short IPI is a significant factor in adverse fetal outcomes, negatively impacting maternal and child well-being.

INTRODUCTION

The timing of pregnancies, encompassing the period between gestation and the post-pregnancy phase, plays a pivotal role in maternal and child well-being. The Interpregnancy Interval (IPI), defined by the World Health Organization (WHO), signifies the duration between live births [1]. A short IPI, characterized as less than 18 months, is associated with adverse outcomes, including an elevated risk of preterm birth, low birth weight, and perinatal death. This heightened risk is particularly notable for women with a history of complications in their first pregnancy, emphasizing the importance of considering past obstetric experiences in assessing interpregnancy intervals [2]. Beyond its impact on immediate neonatal outcomes, short IPI has broader implications, including its association with preterm premature rupture of membranes (PPROM) [3, 4]. This complication significantly contributes to overall preterm birth rates, amplifying neonatal morbidity and mortality. Recognizing the socioeconomic context prevalent in many third-world countries further underscores the urgency of addressing health disparities through birth spacing. Women with lower socioeconomic status are particularly vulnerable to adverse pregnancy

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outcomes, emphasizing the potential of birth spacing as an avenue to mitigate health inequities and reduce unfavorable effects [5, 6]. Short IPI poses risks during pregnancy and extends its implications to subsequent deliveries. Research indicates that females with fewer preceding interpregnancy periods are an independent consequence of highly preterm birth, moderately preterm birth, and death in neonates, irrespective of congenital abnormalities [7]. Complications associated with the second birth are further intensified when the first pregnancy has encountered issues, leading to a substantial surplus of intrauterine development restriction, preterm birth, and perinatal deaths in initial births. These findings underscore the importance of considering the interpregnancy interval and the mother's obstetric history when evaluating outcomes [8, 9]. Examining the correlation between short IPI and harmful effects in vaginal deliveries after previous cesarean sections reveals an increased threat of uterine damage and other obstacles [10]. The risk triples for patients with Vaginal Birth After Cesarean (VBAC) having short IPI, necessitating careful case selection and counselling. The study's primary objective is to identify short IPI as a significant risk factor in the Khyber Pakhtunkhwa (KPK) population [11]. This region's socioeconomic fragility and limited healthcare resources amplify the potential health risks of short IPI. The research underscores the need for preventive measures, health education during the post-natal period, and improved access to family planning services to enhance the well-being of both mothers and children in socio-economically vulnerable communities [12]. This investigation aimed to find the frequency of different fetal outcomes in women with short inter-pregnancy intervals.

METHODS

In obstetrics, the terms "multigravida," "grand multigravida," and "great grand multigravida" are used to categorize women based on the number of pregnancies they have experienced [9, 11]. A multigravida refers to a woman who has been pregnant two or more times. Therefore, a multigravida has experienced two or more pregnancies, regardless of the outcome of those pregnancies. A grand multigravida is a female who has had five or more pregnancies and has a significant reproductive history. A great grand multigravida is a female who has had ten or more pregnancies and has undergone the experience of being pregnant ten or more times, representing a substantial reproductive history [13]. Cross-sectional research was conducted for almost nine months from September 28, 2020, to June 20 2021, in Department of Obstetrics and Gynaecology, Ayub Teaching Hospital, Abbottabad. Ethical approval was taken from ethical review committee. The sample size was calculated to be n=170 by following the World Health Organization sample size calculator with the following assumptions: Confidence interval = 95%. Predicted population proportion = 4.14% for perinatal death. Absolute precision = 3%. The non-probability consecutive sampling was followed to obtain the data from patients. These parameters are included in the inclusion criteria: All the pregnant women had short inter-pregnancy intervals presenting at 20 weeks of gestation. The age range of patients above 16 years and below 45 years. These parameters are included in the exclusion criteria: Subjects having multiple gestations on the ultrasound. These include preterm labour, premature rupture of membrane, short for gestational age, postpartum haemorrhage, women having any infections during pregnancy or having any metabolic disease, e.g. diabetes, etc. The following procedure was followed for data collection: Notified printed consent was used from the selected female who fulfilled the selection criteria after permission was sought for this study. Women presenting in the OPD after the 20th week of gestation who fitted the criteria (i.e., pregnant women with a singleton pregnancy with short inert-pregnancy interval) were taken to a separate place. They elaborated the objectives and benefits of the research for informed consent. The data collection proforma documented each patient's detailed history and clinical examination regarding gravidity, parity, gestational age, last baby born, and presenting complaints. General physical examination, which included per abdomen assessment and vaginal examination, was performed according to gestational age. The radiology department will carry out obstetric ultrasound for proper fetal growth and weight of the baby. All the women were followed up regularly to detect common maternal outcomes (premature rupture of membranes, C-section). Outcome measures of fetal data were also collected. Fetal data included; (1) Period of gestation as the duration calculated in weeks from the previous menstrual cycle to the date of the child's birth. (2) Perinatal deaths encompass fetal deaths with a presumed gestation period of 28 weeks or more and infant deaths occurring within the first week of life. (3) Birth weight data included babies weighing less than 2.5 kg, which signifies low birth weight. The gathered data underwent analysis using SPSS version 21.0. Quantitative variables like age, gravidity, parity, gestation period and baby weight were described as mean ± S.D. Frequencies and percentages were calculated for categorical variables like premature rupture of membranes, preterm birth and low birth weight. Common maternal and fetal outcomes were stratified among age, gravity and parity to see the effect of modifications. All the data has been presented in

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the form of tables and diagrams.

RESULTS

The study was conducted at the Gynecology Department, Rural Health Center, Kangra, District Haripur, Khyber Pakhtunkhwa, Pakistan. A total of 170 female patients were included in the study to find out the fetal outcomes among women with short IPI presenting in their second and third trimesters. A short IPI was defined as an interval of less than 18 months between the live birth and the subsequent pregnancy. Maternal age among 170 patients was analyzed in frequencies and percentages (Table 1). Maternal age was divided into 4 categories, i.e. from <20 to >40. 21(12.35%) patients were grouped in category of <20, 93 (54.70%) females were in age range of 31-40 years, 46 (27.06%) females in age range of 31-40 years and 10 (5.88%) in >40 age category. The mean age was 30 years, with an S.D. of ±1.27.

Table 1: Frequencies and percentages of maternal age (n=170)

Age	Frequency (%)
<20 Years	21 (12.35)
21 – 30 Years	93 (54.70)
31 – 40 Years	46 (27.06)
>40 Years	10 (5.88)
Total	170 (1000)
Mean	30 with S.D = ±1.27

The gravidity status regarding frequencies and percentages was also analyzed (Table 2). The gravidity status was divided into 3 main categories, i.e. multi gravida, grand gravida and great grand multigravida. Among 170 patients, 132 (77.65%) were multigravida, 32 (18.82%) were grand multigravida, and 6 (3.53%) were great grand multigravida.

Table 2: Frequencies and percentages of gravidity (n=170)

Gravidity	Frequency (%)
Multi gravida	132 (77.65)
Grand multigravida	32 (18.82)
Great grand multigravida	6 (3.53)
Total	170 (100)

Frequencies and percentages were calculated for the poor fetal outcomes of the studied sample in table 3. Among 170 females, 53 (31.17%) had preterm premature rupture of membranes of the fetus, 63 (37.05%) had neonates with preterm birth, 20 (11.76%) suffered early neonatal death, and 34 (20.21%) had newborns with low birth weight.

Table 3: Frequencies and percentages of fetal outcomes (n=170)

Fetal outcomes	Frequency (%)
Preterm Premature Rupture of Membranes	53 (31.17)
Preterm birth	63 (37.05)
Early neonatal death	20 (11.76)
Low birth weight	34 (20.21)

Correlation of fetal outcomes in age groups n=170 are shown in table 4.

Table 4: Correlation of fetal outcomes in age groups (n=170)

Fetal outcomes	Maternal age				Total
	<20 years	21-30 years	31-40 years	>40 years	
Premature Rupture of Membranes	0	3	16	34	53
Preterm Birth	0	4	24	35	63
Early Neonatal Death	3	4	10	3	20
Low Birth Weight	10	11	7	6	34

The frequencies and percentage of fetal outcomes in gravidity n=170 are shown in table 5.

Table 5: Frequencies and percentages of fetal outcomes in gravidity (n=170)

Fetal outcomes	Gravidity			Total
	Multi Gravida	Grand Multi Gravida	Great Grand Multi Gravida	
Premature Rupture of Membranes	34	21	2	57
Preterm Birth	39	15	4	58
Early Neonatal Death	17	5	1	23
Low Birth Weight	17	12	3	32
Total	107	53	10	170

DISCUSSION

It is well established that a short inter-pregnancy interval (IPI) is associated with an increased risk of adverse fetal outcomes in subsequent pregnancies [13]. This study focused on the population of the Rural Health Center in Kangra, District Haripur, Khyber Pakhtunkhwa, Pakistan, with most patients from average to low-income households. The potential confounding factors of illiteracy and poor socioeconomic conditions in this area need separate investigation. Despite efforts to control factors influencing low birth weight, preterm delivery, and intrauterine growth restriction (IUGR), it is acknowledged that other factors may have influenced the findings [14]. The IPI plays a crucial role in newborn health outcomes, considering factors such as preterm premature rupture of membranes, preterm birth, early neonatal death, low birth weight, and small for gestational age (SGA). The study found that a significant percentage of sampled females experienced preterm premature rupture of membranes (32%), preterm birth (39%), early neonatal death (12%), and low birth weight (25%). Gravidity distribution indicated that 78% were multigravida, 19% grand multigravida, and 4% great grand multigravida [15, 16]. Using recent nationally representative Demographic and Health Survey (DHS) data, researchers examined infant mortality in patients under 18 years and over 18 years, considering IPI less than 24 months and greater than 24 months for the firstborn child [17]. The study concluded that both young maternal age and short IPI increased the risk of infant mortality in developing

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countries like Pakistan and India, reaching up to 26% in young mothers. Similar concerns were raised in studies conducted in Pakistan [18]. Various studies, including a large one with over 1.1 million pregnancies, consistently reported that short IPI (18 months or less) increased the risk of infant mortality, with the shortest IPI (<6 months) predicting the highest rates even after adjusting for confounders. Infants born to women with short IPI had increased risks of preterm birth, low birth weight, and perinatal death [19]. Another study associated short IPI with a higher risk of preterm birth, low birth weight, and perinatal death [20]. Recent studies emphasized the importance of IPI on adverse perinatal outcomes in both prior-term and preterm births. A cohort study found that a short IPI (<6 months) was linked to increased risks of extreme preterm birth, moderate preterm birth, and neonatal death in subsequent pregnancies [21]. In conclusion, our data highlights the increased risk of preterm premature rupture of membranes and earlier preterm deliveries in women with a short IPI (≤6 months). We did not find any normal outcome of IPI in any of the cases in our study. The absence of normal outcomes could be attributed to various factors such as complications, adverse events, or specific characteristics of the population we studied. So, targeted counselling and therapies for this high-risk group are warranted, considering the significant public health and cost burden associated with these cases. Previous research, both in low and high-income countries, indicates that both short and long-term IPIs are associated with adverse maternal, perinatal, and infant outcomes. Short IPI is linked to higher risks of perinatal, infant, and child mortality, as well as preterm birth, low birth weight, and fetal growth restriction, while long IPI is associated with increased risks of preterm birth, low birth weight, labor dystocia, preeclampsia, and eclampsia [22, 23].

CONCLUSIONS

The objective of the current study was to investigate whether short IPI has detrimental implications for the fetus. The unfavourable fetal outcomes that were considered are LBW, SGA (Preterm birth), PPROM and perinatal death. It was established that short IPI is a major factor in producing poor fetal outcomes and has detrimental effects on the mother as well as the child's well-being. The short IPI might have dire implications in our society where compromised socioeconomic conditions, malnutrition, lack of education and early childhood marriages are prevalent. Since these factors also contribute to the already present imminent threat to newborns, there is a need for further research in this area to highlight these issues. This study's results highlight that current public health recommendations for suitable interpregnancy intervals in obstetrics need to be implemented for all women, the importance of which cannot be further emphasized.

Authors Contribution

Conceptualization: SSI
Methodology: SSI
Formal analysis: AA
Writing-review and editing: AA, SSI

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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