The prevalence of short inter-pregnancy interval and its associated risk factors among women attending primary health care centers of NGHA in Jeddah, Saudi Arabia: A cross-sectional study

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ABSTRACT

Background: The inter-pregnancy interval (IPI) refers to the time between one pregnancy and the next. Studies have shown that IPIs shorter than 18 months are linked to negative outcomes, such as preterm delivery, infant mortality, and small-for-gestational-age birth. The aim of this study was to measure the prevalence and risk factors of short inter-pregnancy intervals among women receiving care at primary health centers in Jeddah, Saudi Arabia. **Methods and Material:** This is a cross-sectional study conducted at primary health care centers among mothers with a history of giving birth to at least one child and having two successive pregnancies. The data was collected through face-to-face interviews using a structured questionnaire. Statistical analysis was carried out using RStudio (R version 4.3.0). **Results:** A total of 300 responses were analyzed. The prevalence of short IPI was 36.0%, 31.0% had prolonged IPI, and 33.0% had optimal IPI. Lower educational level, unemployment as a student, low or middle income, a rise in the number of children, typically more than six, and an increase in the number of male offspring, mostly four or more, lack of breastfeeding, and breastfeeding duration have all been identified as statistically significant risk factors for short IPIs. **Conclusions:** Short inter-pregnancy interval is prevalent in Jeddah city, which can negatively impact the perinatal outcomes. Addressing the risk factors and providing proper education in antenatal and postnatal clinics to reduce the number of unintended pregnancies can help in decreasing the number of short inter-pregnancy intervals and improving maternal and fetal outcomes.

Keywords: Associated factors, cross-sectional, inter-pregnancy interval, perinatal outcome, Saudi Arabia, short, women

Introduction

The inter-pregnancy interval (IPI), the gap between childbirth and the next pregnancy, influences various clinical outcomes. Short IPIs (<18 months) can lead to negative outcomes like preterm delivery, infant mortality, and small-for-gestational-age

birth.[1-3] While definitions for short and long IPIs vary, guidelines generally recommend 18-24 months IPI after a live birth.[4,5] The exact impact of IPI on negative outcomes is unclear, but as a controllable factor, it's crucial to consider for possibly reducing these outcomes.[6] However, complications including fetal malposition, maternal hypertension, and fetal growth restrictions were reported due to short IPIs.[7]

A study on US live births from 2012 to 2016 found a 5.7% occurrence of short interpregnancy intervals (IPIs) under

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Access this article online

Quick Response Code:

Website:
http://journals.lww.com/JFMPC

DOI:
10.4103/jfmpc.jfmpc_549_24

How to cite this article: Hemedy RA, Wali RM, Alsulimani FA. The prevalence of short inter-pregnancy interval and its associated risk factors among women attending primary health care centers of NGHA in Jeddah, Saudi Arabia: A cross-sectional study. J Family Med Prim Care 2024;13:4016-24.

6 months and 16.7% under 12 months.[8] Factors such as age at first birth, parity, unintended pregnancy, breastfeeding duration, and contraception non-use were associated with short IPIs. Reducing short IPI prevalence necessitates promoting contraceptive use and optimal breastfeeding.[9] A similar study in rural India involving 98,522 mothers found about half had short IPIs.[10] In Bangladesh, 26% of 5,941 surveyed women had short IPIs, more prevalent among younger, uneducated, rural women.[11] Lastly, in Al-Khobar City, Saudi Arabia, only 26.3% of women had birth intervals under 2 years.[12]

A study with 230,850 women showed the importance of post-birth contraception to prevent short IPIs. Average coverage was 3.81 months, with 55% using user-dependent hormonal contraceptives. Optimal IPIs were achieved with the use of long-acting contraceptives, user-dependent hormonal contraceptives, and Family Planning Access.[13] Primary care centers play a pivotal role in improving access to oral contraceptives and long-acting contraceptives.[14] Family physicians' role is emphasized in providing continuous quality care while preventing diseases and complications among women of reproductive age.[15]

IPIs may negatively impact maternal health, leading to health risks such as osteoporosis and limited breastfeeding duration affecting both the mother and child. This study aims to estimate the prevalence of short IPIs among Saudi Arabian mothers and to identify the associated risk factors.

Subjects and Methods

Study design

A cross-sectional analytic study was conducted, focusing on mothers who had given birth to at least one child and had two consecutive pregnancies. The study took place at primary health care centers in Jeddah, Saudi Arabia. A structured questionnaire was used to interview the participants, gathering information on two main areas; first part included demographic data and medical history. The second part of the questionnaire included obstetric and gynecological history IPI, and details about the last child and the child before the last child.

Study settings

The study was carried out at four Primary Healthcare Centers of the Ministry of National Guard-Health Affairs in Jeddah, Saudi Arabia. After explaining the study objectives and obtaining consent, data were collected from female participants in the waiting areas. The study duration was from July 2022 to September 2023.

Study subjects

The equation was created using a 95% confidence level, a 5% margin of error, a 28.5% occurrence of short pregnancy interval, and an estimated target population of 2,000 individuals visiting the Primary Health Care Center (PHCC). The occurrence data was obtained from a study conducted in Ethiopia, as previous studies in Saudi Arabia only provided the average of pregnancy intervals and not the occurrence.[16] The calculated sample size was 300. Convenient sampling was utilized in this study to approach women in the waiting areas. The inclusion criteria included all eligible women aged 15-50 who attended PHCC, had given birth to at least one child, and had two or more consecutive pregnancies.

Data collection

Trained investigators conducted data collection through in-person interviews. Since no validated tool exists in the literature to assess the prevalence of IPI, a tool was developed based on the variables of interest, as suggested by the literature. Preliminary studies were conducted to gather the required data from 20-25 women. The measurement of IPI was defined as the time period between the date of live birth of the previous child and the self-reported last normal menstrual period.[17]

Statistical analysis

Statistical analysis was conducted using RStudio (R version 4.3.0). Categorical variables were reported as frequencies and percentages. The differences between different categories of IPIs in relation to various variables were assessed using Pearson's Chi-squared or Fisher's exact test, as appropriate. A multinomial regression model was used, incorporating the variables significantly associated with sociodemographic characteristics, chronic diseases, and obstetric and gynecological characteristics. These variables were treated as independent variables. Some categories of these independent variables were merged to avoid zero frequencies and obtain the best-fit criteria. The prolonged IPI category was used as the reference category. The results of the regression analysis were presented as odds ratios (O.R.s) and 95% confidence intervals (95%CIs). A *P* value of <0.05 was considered as statistically significant.

Ethical considerations

Ethical approval was obtained from the Institutional Review Board of (King Abdullah International Medical Research Center) with reference number (IRB/1908 / 22) dated Sept 14, 2022. Ethical principles were maintained throughout the research process. Informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity were assured throughout the study without the use of any personal identifiers were used. All data were stored on workplace computers accessed only by the author.

Results

In the current study, data from 300 women who attended a primary healthcare center (PHCC) with a history of giving birth to at least one child and having two successive pregnancies were analyzed. Most mothers fell within the age group of 41 to 50 years, 132 (44.0%), whereas 123 mothers (41.0%) were aged 31 to 40 years. Participants were predominantly married (*n* = 262, 87.3%) and held university degrees (*n* = 171, 57.0%). Employment status showed that a significant proportion were

Characteristic	Overall	Inter-pregnancy interval			
	N=300	Short N=108	Optimal N=99	Prolonged N=93	P
Age (years)					0.688
21 to 30	45 (15.0%)	16 (35.6%)	15 (33.3%)	14 (31.1%)	
31 to 40	123 (41.0%)	39 (31.7%)	45 (36.6%)	39 (31.7%)	
41 to 50	132 (44.0%)	53 (40.2%)	39 (29.5%)	40 (30.3%)	
Marital status					0.508
Married	262 (87.3%)	96 (36.6%)	82 (31.3%)	84 (32.1%)	
Divorced	30 (10.0%)	9 (30.0%)	13 (43.3%)	8 (26.7%)	
Widowed	8 (2.7%)	3 (37.5%)	4 (50.0%)	1 (12.5%)	
Educational level					0.004
Illiterate	4 (1.3%)	3 (75.0%)	1 (25.0%)	0 (0.0%)	
Primary	14 (4.7%)	8 (57.1%)	0 (0.0%)	6 (42.9%)	
Middle school	10 (3.3%)	6 (60.0%)	3 (30.0%)	1 (10.0%)	
Secondary	74 (24.7%)	29 (39.2%)	31 (41.9%)	14 (18.9%)	
University degree	171 (57.0%)	55 (32.2%)	54 (31.6%)	62 (36.3%)	
Post-graduate	27 (9.0%)	7 (25.9%)	10 (37.0%)	10 (37.0%)	
Employment status					0.001
Student	5 (1.7%)	4 (80.0%)	0 (0.0%)	1 (20.0%)	
Employee	191 (63.7%)	57 (29.8%)	72 (37.7%)	62 (32.5%)	
Self-Employed	4 (1.3%)	0 (0.0%)	0 (0.0%)	4 (100.0%)	
Housewife	100 (33.3%)	47 (47.0%)	27 (27.0%)	26 (26.0%)	
Educational levels of the husband					0.673
Illiterate	3 (1.0%)	3 (100.0%)	0 (0.0%)	0 (0.0%)	
Primary	4 (1.3%)	2 (50.0%)	1 (25.0%)	1 (25.0%)	
Middle school	24 (8.0%)	11 (45.8%)	7 (29.2%)	6 (25.0%)	
Secondary	110 (36.7%)	35 (31.8%)	39 (35.5%)	36 (32.7%)	
University degree	138 (46.0%)	52 (37.7%)	44 (31.9%)	42 (30.4%)	
Post-graduate	21 (7.0%)	5 (23.8%)	8 (38.1%)	8 (38.1%)	
Employment status of the husband					0.223
None	29 (9.7%)	16 (55.2%)	7 (24.1%)	6 (20.7%)	
Employee	255 (85.0%)	88 (34.5%)	85 (33.3%)	82 (32.2%)	
Self-Employed	16 (5.3%)	4 (25.0%)	7 (43.8%)	5 (31.3%)	
Monthly income (SAR)					0.001
Low or middle (20,000 or less)	195 (65.0%)	78 (40.0%)	50 (25.6%)	67 (34.4%)	
High (>20,000)	105 (35.0%)	30 (28.6%)	49 (46.7%)	26 (24.8%)	
Age at first marriage (years)					0.491
10 to 19	91 (30.3%)	36 (39.6%)	25 (27.5%)	30 (33.0%)	
20 to 24	137 (45.7%)	48 (35.0%)	50 (36.5%)	39 (28.5%)	
25 to 29	67 (22.3%)	24 (35.8%)	22 (32.8%)	21 (31.3%)	
30 to 45	5 (1.7%)	0 (0.0%)	2 (40.0%)	3 (60.0%)	
Age at first delivery (years)					0.110
10 to 19	49 (16.3%)	21 (42.9%)	11 (22.4%)	17 (34.7%)	
20 to 24	148 (49.3%)	52 (35.1%)	53 (35.8%)	43 (29.1%)	
25 to 29	84 (28.0%)	28 (33.3%)	33 (39.3%)	23 (27.4%)	
30 to 45	19 (6.3%)	7 (36.8%)	2 (10.5%)	10 (52.6%)	
Number of children					0.006
None	1 (0.3%)	1 (100.0%)	0 (0.0%)	0 (0.0%)	
1 to 3	108 (36.0%)	29 (26.9%)	36 (33.3%)	43 (39.8%)	
4 to 6	151 (50.3%)	54 (35.8%)	55 (36.4%)	42 (27.8%)	
7 to 9	36 (12.0%)	20 (55.6%)	8 (22.2%)	8 (22.2%)	
10 or more	4 (1.3%)	4 (100.0%)	0 (0.0%)	0 (0.0%)	
Number of female children					0.053
None	23 (7.7%)	5 (21.7%)	4 (17.4%)	14 (60.9%)	
1 to 3	229 (76.3%)	85 (37.1%)	79 (34.5%)	65 (28.4%)	
4 to 6	47 (15.7%)	18 (38.3%)	15 (31.9%)	14 (29.8%)	
7 to 9	1 (0.3%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	

Contd...

Characteristic	Overall	Inter-pregnancy interval			
	N=300	**Short N=108**	**Optimal N=99**	**Prolonged N=93**	**P**
Number of male children					<0.001
None	22 (7.3%)	0 (0.0%)	9 (40.9%)	13 (59.1%)	
1 to 3	228 (76.0%)	80 (35.1%)	79 (34.6%)	69 (30.3%)	
4 to 6	50 (16.7%)	28 (56.0%)	11 (22.0%)	11 (22.0%)	
Total number of miscarriages and stillbirths					0.001
None	187 (62.3%)	57 (30.5%)	76 (40.6%)	54 (28.9%)	
1 to 3	111 (37.0%)	49 (44.1%)	23 (20.7%)	39 (35.1%)	
4 to 6	2 (0.7%)	2 (100.0%)	0 (0.0%)	0 (0.0%)	
Delayed pregnancy for 1 year (despite regular intercourse for 1 year at least without conception)?					0.002
No/Do not know	273 (91.0%)	103 (37.7%)	82 (30.0%)	88 (32.2%)	
Yes	27 (9.0%)	5 (18.5%)	17 (63.0%)	5 (18.5%)	
Irregular menses					0.005
No/Do not know	238 (79.3%)	75 (31.5%)	82 (34.5%)	81 (34.0%)	
Yes	62 (20.7%)	33 (53.2%)	17 (27.4%)	12 (19.4%)	
Having gender preferences for a child					0.018
None	236 (78.7%)	90 (38.1%)	75 (31.8%)	71 (30.1%)	
Yes, boy	32 (10.7%)	11 (34.4%)	15 (46.9%)	6 (18.8%)	
Yes, girl	20 (6.7%)	2 (10.0%)	8 (40.0%)	10 (50.0%)	
Do not know	12 (4.0%)	5 (41.7%)	1 (8.3%)	6 (50.0%)	

Table 2: Results of the multinomial regression analysis for the risk factors of short IPI compared to having an Optimal IPI

Characteristic	Optimal			Short		
	OR	**95% CI**	**P**	**OR**	**95% CI**	**P**
Educational level						
Secondary school or less	Reference	Reference		Reference	Reference	
University degree	1.38	0.52, 3.69	0.520	0.45	0.15, 1.39	0.167
Post-graduate	6.24	0.94, 41.6	0.058	1.94	0.36, 10.3	0.437
Employment status						
Housewife	Reference	Reference		Reference	Reference	
Student	5.96	0.44, 80.5	0.179	36.7	2.39, 564	0.010
Employee/self-employed	0.37	0.14, 0.96	0.041	2.17	0.70, 6.72	0.180
Monthly income (SAR)						
Low or middle (20,000 or less)	Reference	Reference		Reference	Reference	
High (>20,000)	0.36	0.13, 1.04	0.058	0.55	0.19, 1.57	0.265
Number of children						
< 4	Reference	Reference		Reference	Reference	
4 to 6	2.88	1.12, 7.46	0.029	1.00	0.35, 2.84	0.995
> 6	2.82	0.72, 11.0	0.137	5.25	1.42, 19.3	0.013
Total number of miscarriages and stillbirths						
None	Reference	Reference		Reference	Reference	
1 or more	0.65	0.26, 1.61	0.352	1.80	0.71, 4.54	0.216
Delayed pregnancy for 1 year (despite regular intercourse for 1 year at least without conception)?						
No/Do not know	Reference	Reference		Reference	Reference	
Yes	0.25	0.05, 1.15	0.074	1.27	0.25, 6.45	0.776
Irregular menses						
No/Do not know	Reference	Reference		Reference	Reference	
Yes	1.59	0.65, 3.92	0.312	1.65	0.64, 4.25	0.295
Having gender preferences for a child						
None/do not know	Reference	Reference		Reference	Reference	
Yes	0.10	0.02, 0.58	0.011	0.62	0.19, 2.02	0.426

Characteristic	Overall	Inter-pregnancy interval			
	N=300	Short N=108	Optimal N=99	Prolonged N=93	P
Current child age (years)					0.036
< 1	26 (8.7%)	8 (30.8%)	9 (34.6%)	9 (34.6%)	
1 to 5	94 (31.3%)	34 (36.2%)	23 (24.5%)	37 (39.4%)	
6 to 10	71 (23.7%)	28 (39.4%)	18 (25.4%)	25 (35.2%)	
11 to 15	42 (14.0%)	13 (31.0%)	18 (42.9%)	11 (26.2%)	
> 15	67 (22.3%)	25 (37.3%)	31 (46.3%)	11 (16.4%)	
Pregnancy duration (weeks)					<0.001
Full term	261 (87.0%)	105 (40.2%)	79 (30.3%)	77 (29.5%)	
Preterm	28 (9.3%)	0 (0.0%)	15 (53.6%)	13 (46.4%)	
Late term	11 (3.7%)	3 (27.3%)	5 (45.5%)	3 (27.3%)	
Post-term	0 (0.0%)	0 (NA%)	0 (NA%)	0 (NA%)	
Breastfeeding duration (months)					<0.001
None	32 (10.7%)	18 (56.3%)	6 (18.8%)	8 (25.0%)	
1 to 3	49 (16.3%)	17 (34.7%)	4 (8.2%)	28 (57.1%)	
4 to 6	58 (19.3%)	18 (31.0%)	15 (25.9%)	25 (43.1%)	
> 6	139 (46.3%)	49 (35.3%)	64 (46.0%)	26 (18.7%)	
Still breastfeeding	22 (7.3%)	6 (27.3%)	10 (45.5%)	6 (27.3%)	
Contraceptive method prior conception-None					0.554
No	221 (73.7%)	80 (36.2%)	76 (34.4%)	65 (29.4%)	
Yes	79 (26.3%)	28 (35.4%)	23 (29.1%)	28 (35.4%)	
Contraceptive method prior conception-IUCD (copper/ Hormonal)					0.357
No	233 (77.7%)	81 (34.8%)	75 (32.2%)	77 (33.0%)	
Yes	67 (22.3%)	27 (40.3%)	24 (35.8%)	16 (23.9%)	
Contraceptive method prior conception-Schedule method					<0.001
No	289 (96.3%)	108 (37.4%)	97 (33.6%)	84 (29.1%)	
Yes	11 (3.7%)	0 (0.0%)	2 (18.2%)	9 (81.8%)	
Contraceptive method prior conception-Combined Oral contraceptive pills, patches, or rings					0.220
No	246 (82.0%)	83 (33.7%)	84 (34.1%)	79 (32.1%)	
Yes	54 (18.0%)	25 (46.3%)	15 (27.8%)	14 (25.9%)	
Contraceptive method prior conception-Progesterone pills					0.893
No	266 (88.7%)	95 (35.7%)	89 (33.5%)	82 (30.8%)	
Yes	34 (11.3%)	13 (38.2%)	10 (29.4%)	11 (32.4%)	
Contraceptive method prior conception-Male/female condom/ cervical cap/sponge					0.619
No	284 (94.7%)	104 (36.6%)	92 (32.4%)	88 (31.0%)	
Yes	16 (5.3%)	4 (25.0%)	7 (43.8%)	5 (31.3%)	
Contraceptive method prior conception-DMPA (monthly injections)					0.394
No	296 (98.7%)	108 (36.5%)	97 (32.8%)	91 (30.7%)	
Yes	4 (1.3%)	0 (0.0%)	2 (50.0%)	2 (50.0%)	
Contraceptive method prior conception-Withdrawal method					0.001
No	285 (95.0%)	97 (34.0%)	99 (34.7%)	89 (31.2%)	
Yes	15 (5.0%)	11 (73.3%)	0 (0.0%)	4 (26.7%)	
Contraceptive method prior conception-Implant					<0.001
No	281 (93.7%)	108 (38.4%)	83 (29.5%)	90 (32.0%)	
Yes	19 (6.3%)	0 (0.0%)	16 (84.2%)	3 (15.8%)	
Contraceptive method prior conception-Locational amenorrhea					0.310
No	299 (99.7%)	108 (36.1%)	99 (33.1%)	92 (30.8%)	
Yes	1 (0.3%)	0 (0.0%)	0 (0.0%)	1 (100.0%)	
Planned pregnancy					0.239
No	112 (37.3%)	48 (42.9%)	34 (30.4%)	30 (26.8%)	
Yes	176 (58.7%)	58 (33.0%)	59 (33.5%)	59 (33.5%)	
Do not know	12 (4.0%)	2 (16.7%)	6 (50.0%)	4 (33.3%)	

Contd...

Characteristic	Overall	Inter-pregnancy interval			
	N=300	Short N=108	Optimal N=99	Prolonged N=93	P
Table 3: Contd...					
Received postpartum contraceptive care after delivery of this child					<0.001
No	136 (45.3%)	65 (47.8%)	27 (19.9%)	44 (32.4%)	
Yes	161 (53.7%)	41 (25.5%)	72 (44.7%)	48 (29.8%)	
Do not know	3 (1.0%)	2 (66.7%)	0 (0.0%)	1 (33.3%)	
Received preconception care and counseling about pregnancy interval prior to the conception of this child					<0.001
No	164 (54.7%)	67 (40.9%)	34 (20.7%)	63 (38.4%)	
Yes	124 (41.3%)	32 (25.8%)	65 (52.4%)	27 (21.8%)	
Do not know	12 (4.0%)	9 (75.0%)	0 (0.0%)	3 (25.0%)	

employees (n = 191, 63.7%). Regarding monthly income, most participants reported a low or middle income (20,000 SR or less/5,331 USD or less, 65.0%). When considering husbands' educational level, a university degree was the most common (*n* = 138, 46.0%). Additionally, most husbands were employed (*n* = 255, 85.0%). Among the women under study, (*n* = 137, 45.7%) got married for the first time between the ages of 20 and 24, and (*n* = 148, 49.3%) had their first child within the same age range. The majority of women (*n* = 151, 50.3%) had between 4 and 6 children, and (*n* = 27, 9.0%) reported delayed pregnancy despite regular intercourse for at least 1 year. See more detailed information regarding participants demography and gynecological history in Table 1.

The prevalence of short IPI was (*n* = 108, 36.0%). Additionally, (*n* = 93, 31.0%) had prolonged IPI, and (*n* = 99, 33.0%) had optimal (normal) IPI. Further analyses were done to identify significantly associated factors with short IPI and revealed that educational level had a significant association with short IPIs (*P* = 0.004). Employment status was also significantly linked, with students having an 80.0% prevalence of short IPIs (*P* = 0.001). Monthly income showed a significant association with a higher prevalence of short IPIs among mothers with low or middle income (40.0%) compared to those with high income (28.6%, *P* = 0.001). Notably, the proportions of short IPIs increased with the total number of miscarriages and stillbirths (*P* = 0.001) and irregular menses (*P* = 0.005); yet, the proportions decreased among women with a delayed pregnancy for 1 year (*P* = 0.002). Detailed comparisons of short IPI and demography are shown in Table 1.

In a regression analysis, an optimal IPI was used as a reference group. Short IPI was significantly predicted by being a student (OR =36.7, 95%CI: 2.4 - 564.0), and having more than six children (OR =5.3, 95%CI: 1.4 - 19.3). These comparisons were done regardless of other risk factors. Further comparisons included demographic variables to predicted short and optimal IPI using prolonged IPI as a reference category. The detailed results are presented in Table 2.

Focusing on the data of the last child, there were significant differences in the proportions of short IPIs in terms of the current child's age (*P* = 0.036) and pregnancy duration (*P* < 0.001). Short IPIs were associated with a significantly lower incidence of receiving postpartum contraceptive care after delivery (*P* < 0.001) and receiving preconception care and counseling about pregnancy intervals prior to the conception of this child (*P* < 0.001). On the other hand, short IPIs were significantly associated with using the withdrawal method for contraception (*P* = 0.001). Short IPIs were also considerably higher among those who did not breastfeed (*P* < 0.001). For further information about the last child, please refer to Table 3.

Regarding the child prior to the last child, there were significant differences in the proportions of short IPIs in terms of the current child's age (*P* < 0.001) and breastfeeding duration (*P* < 0.001). Furthermore, short IPIs were significantly associated with lower proportions of using implants as a contraceptive method (*P* < 0.001), and receiving preconception care and counseling about pregnancy interval prior to the conception (*P* < 0.001). For the detailed results, please refer to Table 4.

Discussion

The definitions for short and long IPI have not been standardized and, therefore, vary among studies. According to the World Health Organization (WHO), a short IPI interval can be considered as ≥6 to 18 months and is associated with an increased perinatal risk. There may still be some residual high risk associated with an 18-to-27-month interval.[18] Providing postpartum/postabortion patients with contraception and information can help prevent adverse outcomes related to short inter-pregnancy interval (IPI). WHO defines a long IPI as more than 60 months, yet intervals over 35 months also pose risks. Factors like partner availability, subfertility, or economic issues may hinder avoiding a long IPI.[18] According to the Centers for Disease Control and Prevention (CDC), 30% of United States (US) females had an IPI less than 18 months, half had an interval of 18 to 59 months, and 20% more than 60 months. Young maternal age increases the risk for a short IPI, with 67% of teenagers 15 - 19 and 35% aged 20 - 29 having a short IPI.[19] It is reported that three in ten American girls will get pregnant before the age of 20, resulting in almost 750,000 pregnancies per year.[20]

Around 89% of teen births take place outside of marriage, with risk factors including race, sexuality, homelessness, low education, foster care, exposure to drugs, and violence.[19] The

Characteristic	Overall	Inter-pregnancy interval			
	N=300	Short N=108	Optimal N=99	Prolonged N=93	P
Current child age (years)					<0.001
< 1	14 (4.7%)	9 (64.3%)	0 (0.0%)	5 (35.7%)	
1 to 5	75 (25.0%)	34 (45.3%)	16 (21.3%)	25 (33.3%)	
6 to 10	67 (22.3%)	17 (25.4%)	28 (41.8%)	22 (32.8%)	
11 to 15	58 (19.3%)	11 (19.0%)	25 (43.1%)	22 (37.9%)	
> 15	86 (28.7%)	37 (43.0%)	30 (34.9%)	19 (22.1%)	
Pregnancy duration (weeks)					0.004
Full term	262 (87.3%)	96 (36.6%)	84 (32.1%)	82 (31.3%)	
Preterm	25 (8.3%)	12 (48.0%)	10 (40.0%)	3 (12.0%)	
Late term	13 (4.3%)	0 (0.0%)	5 (38.5%)	8 (61.5%)	
Post-term	0 (0.0%)	0 (NA%)	0 (NA%)	0 (NA%)	
Breastfeeding duration (months)					
None	37 (12.3%)	16 (43.2%)	6 (16.2%)	15 (40.5%)	< 0.001
1 to 3	40 (13.3%)	18 (45.0%)	4 (10.0%)	18 (45.0%)	
4 to 6	52 (17.3%)	17 (32.7%)	15 (28.8%)	20 (38.5%)	
> 6	163 (54.3%)	53 (32.5%)	74 (45.4%)	36 (22.1%)	
Still breastfeeding	8 (2.7%)	4 (50.0%)	0 (0.0%)	4 (50.0%)	
Contraceptive method prior conception-None					0.241
No	205 (68.3%)	71 (34.6%)	74 (36.1%)	60 (29.3%)	
Yes	95 (31.7%)	37 (38.9%)	25 (26.3%)	33 (34.7%)	
Contraceptive method prior conception-IUCD (copper/Hormonal)					0.197
No	241 (80.3%)	86 (35.7%)	75 (31.1%)	80 (33.2%)	
Yes	59 (19.7%)	22 (37.3%)	24 (40.7%)	13 (22.0%)	
Contraceptive method prior conception-Schedule method					0.079
No	281 (93.7%)	100 (35.6%)	97 (34.5%)	84 (29.9%)	
Yes	19 (6.3%)	8 (42.1%)	2 (10.5%)	9 (47.4%)	
Contraceptive method prior conception-Combined Oral contraceptive pills, patches, or rings					0.245
No	262 (87.3%)	92 (35.1%)	91 (34.7%)	79 (30.2%)	
Yes	38 (12.7%)	16 (42.1%)	8 (21.1%)	14 (36.8%)	
Contraceptive method prior conception-Progesterone pills					0.397
No	265 (88.3%)	98 (37.0%)	84 (31.7%)	83 (31.3%)	
Yes	35 (11.7%)	10 (28.6%)	15 (42.9%)	10 (28.6%)	
Contraceptive method prior conception-Male/female condom/cervical cap/ sponge					0.436
No	289 (96.3%)	106 (36.7%)	94 (32.5%)	89 (30.8%)	
Yes	11 (3.7%)	2 (18.2%)	5 (45.5%)	4 (36.4%)	
Contraceptive method prior conception-DMPA (monthly injections)					0.095
No	298 (99.3%)	108 (36.2%)	99 (33.2%)	91 (30.5%)	
Yes	2 (0.7%)	0 (0.0%)	0 (0.0%)	2 (100.0%)	
Contraceptive method prior conception-Withdrawal method					0.380
No	270 (90.0%)	95 (35.2%)	88 (32.6%)	87 (32.2%)	
Yes	30 (10.0%)	13 (43.3%)	11 (36.7%)	6 (20.0%)	
Contraceptive method prior conception-Implant					<0.001
No	289 (96.3%)	108 (37.4%)	90 (31.1%)	91 (31.5%)	
Yes	11 (3.7%)	0 (0.0%)	9 (81.8%)	2 (18.2%)	
Contraceptive method prior conception-Locational amenorrhea					
No	300 (100.0%)	108 (36.0%)	99 (33.0%)	93 (31.0%)	N.A.
Yes	0(0%)	0(0%)	0(0%)	0(0%)	
Planned pregnancy					<0.001
No	113 (37.7%)	48 (42.5%)	23 (20.4%)	42 (37.2%)	
Yes	183 (61.0%)	58 (31.7%)	76 (41.5%)	49 (26.8%)	
Do not know	4 (1.3%)	2 (50.0%)	0 (0.0%)	2 (50.0%)	

Contd...

Characteristic	Overall	Inter-pregnancy interval			
	N=300	Short N=108	Optimal N=99	Prolonged N=93	P
Received postpartum contraceptive care after delivery of this child					<0.001
No	148 (49.3%)	76 (51.4%)	23 (15.5%)	49 (33.1%)	
Yes	148 (49.3%)	30 (20.3%)	76 (51.4%)	42 (28.4%)	
Do not know	4 (1.3%)	2 (50.0%)	0 (0.0%)	2 (50.0%)	
Received preconception care and counseling about pregnancy interval prior to the conception of this child					<0.001
No	189 (63.0%)	84 (44.4%)	35 (18.5%)	70 (37.0%)	
Yes	107 (35.7%)	21 (19.6%)	64 (59.8%)	22 (20.6%)	
Do not know	4 (1.3%)	3 (75.0%)	0 (0.0%)	1 (25.0%)	

Table 4: Contd...

U.S. CDC reports that older maternal age is a risk factor for a long interpregnancy interval, with 30% of women aged 30 - 44 having a long IPI. Other risk factors include being unmarried, race, and having less than a bachelor's degree.[19] In other regions, a systematic review found that in low- and middle-income countries, a shorter duration of breastfeeding and the previous child being female were consistently associated with short IPI. Young maternal age, lower income, and lower education were less consistently linked with short IPI.[21]

A recent Ethiopian study identified several risk factors for short IPI: rural residence, youth, low education, last child's death, and previous female birth. Factors like higher parity, antenatal care, birthing at health facilities, and postnatal care visits were protective against short IPI.[20] In our study of 300 women, 108 (36.0%) had a short IPI, higher than the U.S. CDC report's 30.0%.[10] Women aged 41 - 50 had the most short IPI (40.2%), followed by those 31 - 40 years (31.7%) and 21 - 30 years (35.6%). This contrasts with the CDC report, associating short IPI with older maternal age.[19]

This can be explained by religious, cultural, or societal factors that influence family planning decisions, such as parity and gender preferences. While (27.0%) had a short IPI (between the first childbirth ending in a live baby and the subsequent conception), which was higher than (20.0%) who had a short IPI (between the last pregnancy and the previous childbirth), this can be attributed to various factors, such as immaturity and a high fertility rate at a young age. It is worth mentioning that in 2016, a cross-sectional survey conducted on a total of 517 mothers revealed that the percentage of breastfeeding (37.5%) observed in Saudi Arabia is significantly higher compared to other countries.[22]

Primary care centers serve as the initial touchpoint for individuals seeking healthcare, playing a crucial role in modern healthcare systems.[23] Their significance is particularly evident in family planning and reproductive health, where they can help decrease the rates of short inter-pregnancy intervals. Training family physicians thoroughly on reproductive health matters is essential. This training helps improve family planning strategies, offers safe access to oral contraceptives, and provides the necessary guidance for their use.[24] Ultimately, the role of primary care centers and well-educated family physicians is instrumental in this context,

especially considering the prevalence of short inter-pregnancy intervals among women attending primary health care centers in Jeddah, Saudi Arabia.

Conclusion

The study examined the prevalence of short IPI among women attending primary health care centers in Jeddah, Saudi Arabia. The findings revealed a prevalence of 36.0% for short IPI. Several risk factors were identified, including higher parity, gender preferences, unintended pregnancy, low educational levels, unemployment, and low income. Lack of postpartum contraceptive care and preconception counselling were also associated with short IPI. Our results emphasize the need for targeted interventions and educational programs to promote optimal IPI and improve maternal and child health outcomes in the region. Further research is needed to better understand the underlying reasons and explore additional risk factors.

Ethical policy and Institutional Review board statement

Ethical approval was obtained from the Institutional Review Board of King Abdullah International Medical Research Center with reference number IRB/1908 / 22 dated Sept 14, 2022.

Patient declaration of consent statement

Ethical principles were maintained throughout the research process. All participants signed an Informed consent form, and confidentiality and anonymity were assured, as no personal identifiers were used. All data were stored on workplace computers accessed only by the author.

Financial support and sponsorship

Conflicts of interest

There are no conflicts of interest.

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