OPEN ACCESS

Research Paper

Duration of Inter-Pregnancy Interval and Its Predictors Among a Sample of Pregnant Women in Reproductive Age Attending Primary Health Care Centers in Al-Russafa /AlShaab Sector

Russul Hamed Mohammed[1], Huda Adnan Habib[2]

ABSTRACT:

BACKGROUND:

Inter-pregnancy interval is defined as the time in completed months from the reported date of live birth of the previous child to the self-reported last normal menstrual period.

OBJECTIVE:

To assess the duration of inter-pregnancy interval, and to assess the possible predictors associated with the duration of inter-pregnancy interval.

PARTICIPANTS & METHODS:

A cross-sectional study was carried out during the period from 1st March to 1st August 2023. A convenient sample of pregnant women in the reproductive age group (15-49 years) who attended PHCCS in Al-Shaab sector, Baghdad-Alrusafa Health Directorate. Data was collected by direct interviews with the target population, the researcher filled out a structured questionnaire that was adapted from a previous study.

RESULTS:

For the 364 study participants (50.5%) were with optimal interpregnancy interval, (41.2) were with short interpregnancy interval. Significant predictors of optimal interpregnancy interval were age at marriage of 20-29 years, middle socioeconomic class, planned pregnancy, contraceptive use, having 2-4 child, good knowledge and encouraging husband about optimal birth spacing.

CONCLUSION:

The predictors of short interpregnancy intervals include marriage at age of 30 years or more, a low socioeconomic index, unplanned pregnancy, having only one live child, not using contraceptive method and poor knowledge about optimal interpregnancy interval

KEY WORDS: Inter-pregnancy interval, knowledge, pregnancy spacing.

[1] MD, Baghdad Teaching Hospital, Ministry of Health, Iraq.
[2]Professor, Consultant family medicine, Alkindy College of Medicine, University of Baghdad, Iraq.

Iraqi Postgraduate Medical Journal, 2025; Vol. 24(3): 303-312
DOI: 10.52573/ipmj.2025.148644 *Received: June 6 , 2024* *Accepted: July 28 , 2024*

INTRODUCTION:

The World Health Organization had defined reproductive health care as: 'A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity, in all matters relating to the reproductive system and to its functions and processes. Reproductive health implies that people are able to have a satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how often to do so' [(1)].

The important aspect of reproductive health care is family planning, which is the ability of individuals and couples to anticipate and attain their desired number of children, the spacing and timing of their births. It is achieved through use of contraceptive methods and the treatment of involuntary infertility [(2)].

Inter-pregnancy interval (IPI) is defined as the time in completed months from the reported date of live birth of the previous child to the self-reported last normal menstrual period (LNMP) [(3,4)]. Another conceptual term known as inter birth interval that defined as a time elapsed from one birth to the next birth [(5)].

The inter-pregnancy interval and inter birth interval are also known as pregnancy spacing and birth spacing [(3)]. Optimal pregnancy spacing is crucial for maternal and child health outcomes and it has been associated with reduced risks of adverse events such as preterm birth, low birth weight, and maternal complications [(6,7)].

After a live birth, the recommended interval before attempting the next pregnancy is at least 24 months to reduce the risk of adverse maternal,

perinatal, and infant outcomes [3]. After a miscarriage or induced abortion, the recommended minimum interval to next pregnancy is at least six months to reduce risks of adverse maternal and perinatal outcomes [3].

Both short intervals between pregnancies (less than 18 months) and long intervals (greater than 60 months) have been associated with increased risks for adverse outcomes [6,7]. In 2005, the World Health Organization (WHO) technical consultation group recommended an optimal interpregnancy interval of a minimum of 24 months or birth to a birth interval of 33 months or more in two consecutive births [3]. Besides this specific optimal interval, the duration may differ based on maternal age, parity, socioeconomic status, and previous pregnancy outcomes [3].

Understanding the causes of short and long interpregnancy interval is essential for developing interventions and programs aimed at promoting optimal pregnancy spacing and improving maternal and child health outcomes. Worldwide studies revealed multiple factors associated with short and long pregnancy intervals.

OBJECTIVES OF THE STUDY:

1. To assess the duration of inter-pregnancy interval among a sample of pregnant women in reproductive age attending PHCCs in Al-Russafa /Alshaab sector
2. To assess the possible predictors associated with the duration of interpregnancy interval.

METHOD:

Across sectional study was carried out during the period from 1st march_1st Aug 2023

A convenient sample of 364 pregnant women in reproductive age group (15-49 years) who attending PHCCs in Al-Shaab sector, Baghdad-AlRusafa Health Directorate. There were 14 PHCCs in Al-Shaab sector; 4 PHCCs were selected by simple random sampling.

Inclusion criteria:

All Pregnant women in reproductive age group (15-49) years who had previous live birth prior to the current pregnancy.

Exclusion criteria:

Pregnant women with history of secondary infertility prior to the current pregnancy.

Secondary infertility defined as: failure to achieve pregnancy after 12 months or more of regular unprotected sexual intercourse, when at one prior pregnancy has been achieved. [8]

Data collection and data instrument:

by direct interviews with the target population. The researcher filled out a structured questionnaire that was adapted from a previous study. [1] Data was collected for 3 consecutive months.

Exposure variables: sociodemographic variables and contraceptive use, breast feeding duration in the preceding child, mode of delivery, male to female ratio in family and mother knowledge regarding the optimal inter-pregnancy interval.

Outcome variables: Inter-pregnancy interval (IPI) which is defined as the time in completed months from the reported date of live birth of the previous child to the self-reported last normal menstrual period (LNMP) [4]. which categorized as follow:

- Short interpregnancy interval: < 24 months
- Optimal interpregnancy interval: 24-60 months
- Long interpregnancy interval > 60 months

The questionnaire includes questions related to:

1- Basic Sociodemographic characteristics:

Age, age at marriage, education, occupation, history of chronic disease in mother Socioeconomic status: using Tariq Al-Hadithi equation {SES = Education + Occupation + House ownership * 0.5 + Car ownership * 0.1 + (age-20)/100–Retired/unemployed/ deceased} [9]. The minimum score would be 0 and the maximum 14.05. The calculated SES score can be divided into equal parts (3: high, middle, and low socioeconomic levels).

2- Gynecological and Obstetrical Data:

- Number of living children
- Is the current pregnancy planned?
- Duration of Inter pregnancy interval between the previous birth and the current pregnancy?
- Mode of delivery?
  - ❖ Vaginal (home, hospital)
  - ❖ Cesarean section
- Duration of breast feeding in the preceding child
- Contraceptive use between last delivery and current pregnancy?
- Male to female ratio in family
- History of miscarriage or still birth in pregnancies prior to the previous delivery

3- Mothers knowledge about optimal interpregnancy interval: [10]

Which assessed through several questions including information about optimal interpregnancy interval, duration of that interval, advantages of optimal interval, disadvantages of short interpregnancy interval and to whom the advantages and disadvantages.

4- Husband beliefs regarding pregnancy spacing:

Scoring:

For the correct answer, one point was given; while for an incorrect and don't know answer zero point was given.

To calculate the total score; the following equation was used:

$$\frac{\text{(sumation of the scores of all items)}}{\text{highest possible score}} \times 100$$

The total score was divided into the:

< 50% score/ considered as poor knowledge.

50-75% score/ considered as fair knowledge.

>75% score/ considered as good knowledge.

Statistical analysis:

Statistical package for social sciences (SPSS) version 26 was used for both data entry and statistical analysis. Descriptive analysis was expressed in (figures, tables), percentage and Chi square tests was used for analyzing data and independent sample t-test to define the significance of the difference of mean age. P value<0.05 was considered as statistically significant.

Ethical Approval:

The ethical approval was obtained from the Center of Training and Human Resources Development. Permission was obtained from Al-Russafa health directorate, the study approved by the ethical committee of Iraqi board for medical specialties, Verbal consent was obtained from all participants. Data was used for this research, and all personal information will be confidential.

Pilot study:

A pilot test was done on a sample of 20 pregnant women to assess the reliability of questionnaire; and the time needed to complete the questions. Those participated in pilot study were excluded from the main study.

RESULTS:

The total study participants were 364 pregnant women of reproductive age. the highest proportion of the study participants, 159 (43.7%) were within the age group 30-39 years, with a mean age of 30.81±6.707.

The youngest participant was 17 years old, and the elder participant was 45years.The highest proportion of the participants 181 (49.7%) were married within the age ≤ 19 years. The youngest age of marriage was 14 years, and the older age of marriage was 36 years. almost half of the participating women were with a low socioeconomic index of 198 (54.4%).

The highest proportion of the study participants 85 (23.4%) were with bachelor's degrees. Table (1).

Table 1: Distribution of study sample according to sociodemographic characteristics

Total		**364**	
Variables		**No.**	**%**
Age groups (years)	≤ 19	16	4.4
	20 – 29	143	39.3
	30 – 39	159	43.7
	40 – 49	46	12.6
Mean ±SD = 30.81±6.707/ minimum=17, maximum= 45			
Age at marriage (years)	≤ 19	181	49.7
	20 – 29	158	43.4
	30 – 39	25	6.9
	40 – 49	0	0.0
Mean ±SD = 20.93±4.959/ minimum=14, maximum= 36			
SEI	Low	198	54.4
	Middle	166	45.6
	High	0	0.0
Mean ±SD = 4.83±2.329/ minimum=0, maximum= 10			
	Illiterate	13	3.6
	Primary (or can read and write)	70	19.2

Education level	Intermediate	67	18.4
	High school or vocational	67	18.4
	Institute (2 years)	61	16.8
	College (bachelor's degree)	85	23.4
	College (master's degree)	1	0.3
	Ph.D. or equivalent	0	0.0

Table (2) shows the highest proportion of the study participants 225 (61.8%) were currently with planned pregnancy. The highest proportion of the study participant 184 (50.5%), had optimal inter pregnancy interval (24-60 months) Participant with 2-4 children were 250 (68.7%), Participating women who used contraception between the last delivery and the current pregnancy were among 287 (78.8%). Using oral contraceptive pills was among the highest proportion 115 (40.1%). Husbands' preference as a reason of not using contraception was among 36 (46.8%). Having females only was among 97 (26.6%) of the study participant.

Table 2: Distribution of study sample according to family planning.

Total		**364**	
Questions	**Answers**	**No.**	**%**
Is the current pregnancy planned	Yes	225	61.8
	No	139	38.2
	Total	364	100.0
Duration of Inter pregnancy interval between the previous birth and the current pregnancy	< 24 months	150	41.2
	24-60 months	184	50.5
	> 60 months	30	8.2
Number of living child	1 child	70	19.2
	2-4 children	250	68.7
	> 4 children	44	12.1
Mean ±SD = 2.73±1.370/ minimum=1, maximum= 7			
Contraceptive use between last delivery and current pregnancy	Yes	287	78.8
	No	77	21.2
If Yes: type?	Oral contraceptive pills	115	40.1
	Coitus interruptus	78	27.2
	IUCD	57	19.9
	Others	37	12.9
If No: why?	Cost	28	36.4
	Religious issues	5	6.5
	Husbands' preference	36	46.8
	Others	8	10.4
Male-to-female ratio in the family:	Males only	60	16.5
	Females only	97	26.6
	Males are equal to females	88	24.2
	Males more than females	88	24.2
	Females more than males	31	8.5

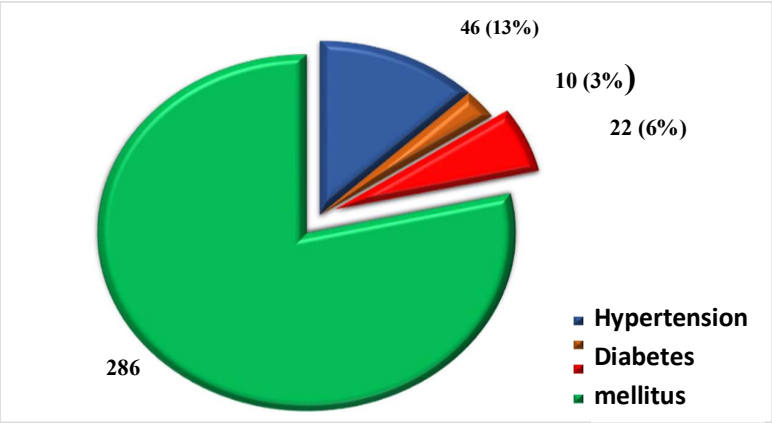

Figure 1: Distribution of study sample according to history of chronic disease.

Most of the participants 286 (78%) had no chronic diseases. hypertension was among 46 (13%) of the participating women, diabetes mellitus was among 10 (3%), Participants with other comorbidities were 22(6%). As illustrated in **figure (1)**

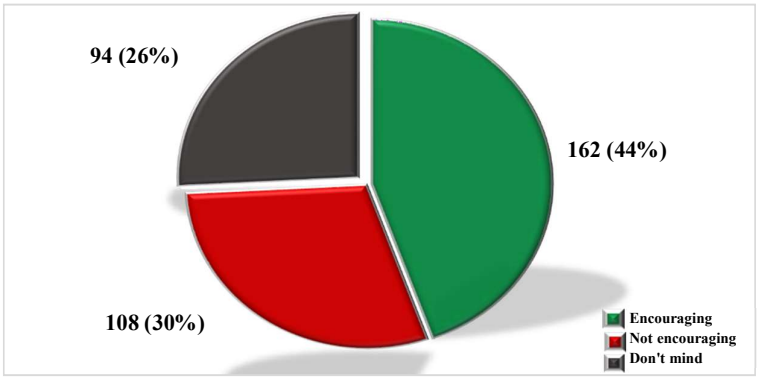

Figure 2: Distribution of study sample according to Husbands beliefs regarding pregnancy spacing.

No significant association existed between participants' current age and the pregnancy interval (P=0.182). there was a significant association between short interpregnancy interval with age at marriage between the ages 30-39 years, where the highest proportion was 18 (72.0%), (P=0.002).

There was a significant association between short interpregnancy intervals with the educational level of primary and illiterate, and the socioeconomic index with low SEI, where the highest proportion of the participants had of primary and illiterate 54 (65.1%) and the highest proportion was 99 (50%) of the participant with low SEI (P<0.001, and 0.005 respectively). As shown in **Table (3)**.

Table 3: The association between interpregnancy interval and the demographic characteristics of the study sample.

Variables	Duration of Inter pregnancy interval between the previous birth and the current pregnancy							
	Total	< 24 mo. N=150		24-60 mo. N=184		> 60 mo. N=30		P-value
		No.	%	No.	%	No.	%	
Age groups (years)								
≤ 19	16	3	18.8	6	37.5	7	43.8	
20 – 29	143	42	29.4	51	35.7	50	35.0	
30 – 39	159	63	39.6	51	32.1	45	28.3	0.182
40 – 49	46	12	26.1	24	52.2	10	21.8	
Age at marriage (years)								
≤ 19	181	80	44.2	83	45.9	18	9.9	**0.002**
20 – 29	158	52	32.9	94	59.5	12	7.6	
30 – 39	25	18	72.0	7	28.0	0	0.0	
Education level								
Illiterate/Primary	83	54	65.1	26	31.3	3	3.6	
Intermediate	67	30	44.8	33	49.3	4	5.9	
High school/ Vocational/Institute	128	56	43.8	65	50.8	7	5.5	**<0.001**
Bachelors/Master/ PhD	86	10	11.6	60	69.8	16	18.6	
SEI								
Low	198	99	50.0	88	44.4	11	5.6	**0.005**
Middle	166	51	30.8	96	57.8	19	11.4	

There was a significant association between short inter pregnancy interval with unplanned pregnancy, and not using contraception, where the highest proportion of women without planning pregnancy was 70 (50.4%), and the highest proportion of the women without contraception was 42 (54.5%), (P=0.020, and 0.027 respectively).

There was a significant association (P<0.001) between inter-pregnancy interval and parity where the highest proportion 50 (71.4%) of women with only one live child had short interpregnancy interval. there was no significant association between Male to female ratio in the family and the inter-pregnancy interval (P=0.901). As shown in **Table (4).**

Table 4: The association between Inter pregnancy interval and the family planning **characteristics of study participants.**

Questions	Answers	Total	< 24 monthsN=150		24-60 monthsN=184		> 60 monthsN=30		P-value
			No.	%	No.	%	No.	%	
Is the current pregnancy planned?	Yes	225	80	35.6	125	55.6	20	8.9	**0.020**
	No	139	70	50.4	59	42.4	10	7.2	
Contraceptive Use	Yes	287	108	37.7	154	53.7	25	8.7	**0.027**
	No	77	42	54.5	30	44.0	5	6.5	
Number of living children	1 child	70	50	71.4	17	24.3	3	4.3	**<0.001**
	2-4 children	250	93	37.2	150	60.0	7	2.8	
	> 4 children	44	7	16.0	17	38.6	20	45.4	
Male to female ratio inthe family	Males only	60	22	36.7	34	56.7	4	6.7	0.901
	Females only	97	42	43.3	47	48.5	8	8.2	
	Males = females	88	40	45.5	42	47.7	6	6.8	
	Males > females	88	36	40.9	44	50.0	8	9.1	
	Females > males	31	10	32.3	17	54.8	4	12.9	

The highest proportion of the study participants 91 (84.3%) had non encouraging husbands regarding pregnancy spacing, with short inter pregnancy interval and this association was significant (P<0.001). As shown in **Table (5)**.

Table 5: The association between Inter pregnancy interval and the husband's beliefs regarding pregnancy spacing among the study participants.

Husband beliefs regarding pregnancy spacing	Total	< 24 months N=150		24-60 months N=184		> 60 months N=30		P-value
		No.	%	No.	%	No.	%	
Encouraging	162	26	16.0	116	71.6	20	12.3	<0.001
Not encouraging	108	91	84.3	15	13.9	2	1.8	
Don't mind	94	33	35.1	53	56.4	8	8.5	

There was a significant association between good knowledge with the current age of the study participants (30-39 years), the educational level of the study participants (Bachelors, and Master), and middle SEI, where the highest proportion of participants was 74.8%, 93.0%, and 66.3% respectively, as shown in Table (6).

Table 6: The association between knowledge level and the demographic characteristics of the study sample.

Variables	Total	Knowledge						P- value
		Poor N=80		Average N=63		Good N=221		
		No.	%	No.	%	No.	%	
Age groups(years)								
≤ 19	16	6	37.5	5	31.2	5	31.2	
20 - 29	143	44	30.8	27	18.9	72	50.3	<0.001
30 - 39	159	18	11.3	22	13.8	119	74.8	
40 - 49	46	12	26.1	9	19.6	25	54.3	
Age at marriage(years)								
≤ 19	181	40	22.1	29	16.0	112	61.9	0.152
20 - 29	158	35	22.1	25	15.8	98	62.0	
30 - 39	25	5	20.0	9	36.0	11	44.0	
Education level								
Illiterate/Primary	83	59	71.1	13	15.7	11	13.2	
Intermediate	67	15	22.4	18	26.9	34	50.7	
High school/ Vocational/Institute	128	6	4.7	26	20.3	96	75.0	<0.001
Bachelors/Master/ PhD	86	0	0.0	6	7.0	80	93.0	
SEI								
Low	198	54	27.3	33	16.7	111	56.0	
Middle	166	26	15.7	30	18.1	110	66.3	0.027

Most of the participant women in the study (71/80) had poor knowledgeand short interpregnancy interval, and this distribution was significant (P<0.001).Illustrated in **Figure (3)**.

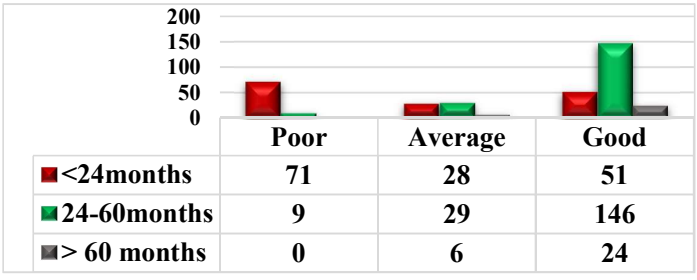

Figure 3: The Distribution of the duration and knowledge of Inter pregnancy interval among study sample.

DISCUSSION:

Short and long interpregnancy intervals are associated with adverse maternal and newborn events. Studies indicate that both short (less than 24 months) and long (greater than 60 months) interpregnancy intervals are associated with adverse maternal and neonatal outcomes. The proportion of optimal interpregnancy interval in the current study was among half of the participants, and the short interpregnancy interval was among more than one third of the participants. The prevalence of optimal and short interpregnancy interval varies widely, globally the short interpregnancy interval is reported around 25% [11]. Egypt reported a short interpregnancy interval of 34.2% [12]. In Bangladesh, the prevalence was ranged from 20.0% to 44.0% [13]. The prevalence of short interpregnancy interval in Oman according to the annual health report from 2019 was estimated as 22.7% [14]. The estimated prevalence of a short interpregnancy interval in Ethiopia was 40.9% [15]. This variation in the reported prevalence was attributed to the differences in the religious beliefs, social norms, and family expectations that affected women's choices regarding their fertility and reproduction. In addition to some differences in the cut-off point of accounting for short interpregnancy interval, in the current study short interpregnancy interval was < 24 months, similarly some studies they considered < 24 months to be the short interpregnancy interval, and other studies considered below 18 months is the short interpregnancy interval, according to the recommendations that depend on the economic income classification of the countries.

The current study found that participants' current age was with no significant association with the interpregnancy intervals. Similar findings were reported in a study Mruts et al., conducted in Ethiopia in 2020 among 469 pregnant women where the current age of women with no significant association with short interpregnancy interval [16]. the present study reported a significant association between age at marriage older than 30 years and short interpregnancy intervals, and age at marriage 20-29 years and optimal interpregnancy interval (24-60) months. Other studies explored the age of first conception with the interpregnancy interval and reported that a short interpregnancy interval was associated with older than 30 years of age of the first conception [15,17]. The proportion of women in the current study who had short interpregnancy intervals was significantly associated with educational level and the highest proportion of short interpregnancy intervals was reported among women with illiterate and primary education, while the highest proportion of those with optimal interpregnancy and long interval was among participants with higher education. Similar findings were reported by Aychiluhm et al., study [18] in Ethiopia 2016, where women who attended secondary education and above levels were 27% less likely to have short interpregnancy interval compared to women without formal education.

Highest proportion of women in the current study with short interpregnancy interval was reported among women with low socioeconomic index, in comparison to the highest proportion of those with optimal and long interpregnancy interval were with middle SEI. In disagreement with the current finding, systematic review by Pimentel et al., [19] analyzed 43 studies from Asia, Africa, and Latin America, in 2020. This might be attributed to people with low socioeconomic index having less access to and the use of effective contraception and family planning services, due to barriers and challenges such as cost, and availability in addition to the social norms., unplanned pregnancies and not using contraception were significant predictors of short interpregnancy intervals among the women of the current study. These findings coincided with previous studies [15,16,17,20]. These findings can be explained by having no plan to control pregnancy by not using contraception method will end with short interpregnancy interval. the number of living child was significantly associated with interpregnancy interval, having only one living child was significantly associated with short interpregnancy intervals among the current study sample. Having 2-4 children were associated with optimal interpregnancy interval and having > 4 children were associated with long interpregnancy interval. This finding goes in line with De Jonge et al. [21] conducted in three districts of among 54,668 women of reproductive age, that found women with parity 4 compared to 1 had an adjusted odd of 0.28 (95%CI=0.19-0.41) and concluded that having lower parity is a predictor of short interpregnancy interval.

The male-to-female ratio of the current study participants was with no significant association with short interpregnancy interval. Similar to Jena et al. study [17] that found the number of children by sex was with no significant association with the interpregnancy interval when adjusting it with the other variables.

Breast-feeding was not significantly associated with short interpregnancy interval as reported by

the current study. This finding was against the previous reports [15,17,20] that found a significant association between the duration of exclusive breastfeeding and the interpregnancy interval where the longer the breastfeeding duration the longer the interpregnancy interval and this was attributed to the amenorrhea caused by exclusive breastfeeding helped in achieving subfertility.

Mode of delivery was with no significant association with the interpregnancy interval. This agreed to Bassey et al., study [20] from Nigeria among 340 participants which also explored the mode of delivery of the previous delivery with the interpregnancy interval and reported no significant association.

Women in the current study with husbands not encouraging birth spacing significantly reported short interpregnancy intervals. While those with husbands encourage birth spacing were with optimal and long interpregnancy interval. This was agreed with Jena et al., study [17] which found that husbands not encouraging birth spacing had an adjusted odd of 1.25 (95%CI=1.05-1.48) of having with short interpregnancy interval.

Good knowledge regarding birth spacing was reported among about two third of the participants of the current study, and good knowledge was significantly associated with optimal interpregnancy interval (24-60 months), while poor knowledge was significantly associated with short interpregnancy interval, younger age, primary and illiterate educational level, and with low socioeconomic index. Concluding that poor knowledge regarding birth spacing is another predictor for short interpregnancy interval. this finding was agreed to A study by Ahlers et al, from Sedgwick country, USA state., [22] that conducted among 125 women in 2015, published in 2018, participants include convenient sample of mother of infant less than one year of age and pregnant mother attending obstetric\pediatric clinic ,mother of NICU graduate who delivered in 2015 also were enrolled ,the result of the study reveal that fewer than 30% of mothers reported previous receiving information about interpregnancy interval ,when the interpregnancy interval was estimated half of interpregnancy interval were less than 18 months.

REFERENCES:

1. WHO. Reproductive Health: World Health Organization 2016. iris.who.int. Updated 2016. Accessed April 10, 2023. https://www.who.int/southeastasia/health-topics/reproductive-health.
2. Oyefabi A, Adelekan B, Nmadu AG, Abdullahi KM. Determinants of desire for child spacing among women attending a family planning clinic in Kaduna, north western Nigeria. Journal of Community Medicine and Primary Health Care. 2019;31(1):48-56.
3. World Health Organization. Report of a WHO technical consultation on birth spacing: Geneva, Switzerland 13-15 June 2005: World Health Organization; 2007 [Available from: https://www.who.int/publications/i/item/WHO-RHR-07.1. Access date: 1st of November 2023.
4. Gebremedhin AT. *Effects of interpregnancy interval on pregnancy complications in a high-income country* (Doctoral dissertation, Curtin University).published in 2021
5. Casterline JB, Odden C. Trends in inter-birth intervals in developing countries 1965-2014. Population and Development Review. 2016:173-94.
6. Bauserman M, Nowak K, Nolen TL, Patterson J, Lokangaka A, Tshefu A, Patel AB, Hibberd PL, Garces AL, Figueroa L, Krebs NF. The relationship between birth intervals and adverse maternal and neonatal outcomes in six low and lower-middle income countries. Reproductive health. 2020; 17:1-0.
7. Ni W, Gao X, Su X, Cai J, Zhang S, Zheng L, Liu J, Feng Y, Chen S, Ma J, Cao W. Birth spacing and risk of adverse pregnancy and birth outcomes: A systematic review and dose–response meta-analysis. Acta Obstetricia et Gynecologica Scandinavica. 2023;102(12):1618-33.
8. WHO. Fact sheet. infertility: April 2023 available on: https://www.who.int/news-room/fact-sheets/detail/infertility.
9. Omer W, Al-Hadithi T. Developing a Socioeconomic Index for Health Research in Iraq. EMHJ 2017;23(10):670-77.
10. Christina N, Cynthia G, Sarah D, Bernice O, Esther A, Mabel A. Knowledge, Attitude and Practice of Birth Spacing among Ghanaian Mothers: Implications for Maternal and Child Nutritional Status. WASJ, 2014;31(11): 1971-78.
11. Schummers L, Hutcheon JA, Hernandez-Diaz S, Williams PL, Hacker MR, VanderWeele TJ, et al. Association of Short Interpregnancy Interval with Pregnancy Outcomes According to Maternal Age. JAMA Internal Medicine. 2018;178(12):1661-70.

12. Mahfouz E, El-Sherbiny N, Hamed W, Hamed NS. Effect of inter-pregnancy interval on pregnancy outcome: a prospective study at Fayoum, Egypt. Int J Med Dev Countries. 2018;2(2):38–44.
13. Islam MZ, Islam MM, Rahman MM, Khan MN. Prevalence and risk factors of short birth interval in Bangladesh: Evidence from the linked data of population and health facility survey. PLOS Global Public Health. 2022;2(4).
14. Ministry of Health/ Birth spacing standard operating procedures. 2012. Last updated 2019. Available at: https://www.moh.gov.om/documents/272928/4017900/Birth+spacing+guideines.pdf/74ce32cd-3b80-2a7a-8344-3a3f4dc2ab8d (accessed 28 January 2024).
15. Mamo H, Dagnaw A, Sharew NT, Brhane K, Kotiso KS. Prevalence of short interpregnancy interval and its associated factors among pregnant women in Debre Berhan town, Ethiopia. PLoS One. 2021;16(8):e0255613.
16. Mruts KB, Tessema GA, Kassaw NA, Gebremedhin AT, Scott JA, Pereira G. Short interpregnancy interval and its predictors in Ethiopia: implications for policy and practice. The Pan African Medical Journal. 2022;42.
17. Jena BH, Biks GA, Gete YK, Gelaye KA. Duration of inter-pregnancy interval and its predictors among pregnant women in urban South Ethiopia: Cox gamma shared frailty modeling. Plos one. 2022;17(8): e0271967.
18. Aychiluhm SB, Tadesse AW, Mare KU, Abdu M, Ketema A. A multilevel analysis of short birth interval and its determinants among reproductive age women in developing regions of Ethiopia. Plos one. 2020;15(8):e0237602.
19. Pimentel J, Ansari U, Omer K, Gidado Y, Baba MC, Andersson N. Factors associated with short birth interval in low-and middle-income countries: a systematic review. BMC pregnancy and childbirth. 2020;20(1):1-7.
20. Bassey G, Nyengidiki TK, Dambo ND. Determinants of interpregnancy interval among parturient in Port Harcourt, Nigeria. Sahel Medical Journal. 2016;19(4):180.
21. De Jonge HC, Azad K, Seward N, Kuddus A, Shaha S, Beard J, Costello A, Houweling TA, Fottrell E. Determinants and consequences of short birth interval in rural Bangladesh: a cross-sectional study. BMC pregnancy and childbirth. 2014;14(1):1-7.
22. Ahlers-Schmidt CR, Woods NK, Bradshaw D, Rempel A, Engel M, Benton M. Maternal knowledge, attitudes, and practices concerning interpregnancy interval. Kansas Journal of Medicine. 2018;11(4):86.