REVIEW ARTICLE

Prevalence of Short Interpregnancy Interval: Systematic Review and Meta-Analysis

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ABSTRACT

Background: Short interpregnancy interval (SIPI) is common despite of all efforts to implement family planning. The prevalence of interpregnancy interval is reported with huge variation using inconsistent definition of SIPI.
Aim: To find pooled prevalence of short interpregnancy interval.
Methodology: The literature was searched using various search engines (google, google scholar) and databases (PubMed, Scopus) and network searching was also done using research through available digital libraries. Only peer reviewed articles, freely available and having clear methodology were included in this study. A total of 540 published studies were found initially after careful screening only 15 studies were included in final analysis..
Results: A total of 15 studies were finally taken in this meta-analysis with total sample size was (n=12840062). The pooled prevalence of SIPI (defined at different intervals) was found as 7.85% (95% CI, 7.81% – 7.91%) using fixed effects and 24.10% (95% CI, 12.70% – 37.80%) using random effect. There was high heterogeneity among the reported prevalence i.e. I^2 = 100% (> 75%) and Q test was highly significant as well (p-value < 0.001). Moreover, the publication bias [Egger's test (73.5007) and Begg's test (0.1429)] was statistically insignificant (p-value > 0.05).
Conclusion: The pooled prevalence of short interpregnancy interval was found high using random effect method. The studies had higher heterogeneity among published prevalence of SIPI mainly due to inconsistent definitions. So, the real picture can be clearer if studies focus on standard definition of SIPI proposed by world health organization.
Keywords: Birth spacing, short inter pregnancy interval, family planning

INTRODUCTION

Inter-pregnancy interval is defined as the time between birth and next conception[1]. According World Health Organization (WHO) short interpregnancy interval (SIPI) is defined if next pregnancy (birth-to-pregnancy interval) occurs before 24 weeks. [2] The duration of birth intervals has received attention in demography and public health research because of its implication on fertility and feto-maternal health outcomes[3]. The global prevalence of SIPI (defined as <24 months) is reported as 24.6%[4] where as in Pakistan the reported prevalence is 34.5%[4]. One of the highest prevalence of SIPI has been reported as 65.9% in Nigeria.[5] According to an American study involving 36 states, about 30% females were found to have SIPI (<18 months)[6]. WHO technical working groups reported that risk of prematurity, fetal death, low birth weight and small size for gestational age are highest in SIPI[2].

Both long and short birth spacing in consecutive pregnancies is associated with worse maternal, fetal, as well as infant outcomes as reported in literature[7,8]. Where SIPI has been reported to increase chances of preterm birth, premature membrane rupture, Low Birth Weight (LBW) and other placental abnormalities, Long Inter-pregnancy Interval (LIPI) on the other hand is also related to increased risk of preeclampsia and uteroplacental bleeding disorders[9]. SIPI has been reported to cause as many as almost 20% of infant deaths [3] and an estimated 74300 deaths under five years can be avoided if birth spacing is improved[10]. One study conducted in Ethiopia reported that increasing the birth spacing to a at least two years can result in reduction of fertility rate by 43% and infant mortality by 50%[11].

However, despite established role of SIPI in bad health related feto-maternal consequences, no consensus has yet been made regarding the exact prevalence of SIPI, primarily due to difference of clinical definitions used in different countries. Therefore, this meta-analysis is designed and conducted to find pooled prevalence of short interpregnancy interval. It will help to understand the current situation about shot birth spacing, and it may help to give another way of attentions to reduce it.

MATERIALS AND METHODS

Study design and search strategies: This meta-analysis was designed and conducted at department of Biostatistics, Faculty of Medicine, Universiti Sultan Zainal Abidin, Medical Campus, Kuala Terengganu, Malaysia. The literature was searched using various search engines (google, google scholar) and databases (PubMed, Scopus). Network searching using Researchgate was also done. BOOLEAN search strategy was opted for searching the articles using keywords and phrases including but not limited to “birth spacing”, “interpregnancy interval”, “short inter delivery time”, “short interpregnancy interval”, “lack of family planning”, “fertility ratio”, “maternal mortality”, “neonatal mortality”, “fetal mortality” and “child mortality” etc. The operative functions of AND and OR were also used for better and braoder search.

Eligibility criteria and study selection: Only peer reviewed, full length, freely available articles having clear methodology were included in this study. Studies with copyright or permission issues were excluded. All articles were retrieved where prevalence of short interpregnancy interval was taken, or where short interpregnancy interval taken as dependent variable (from studies of determinants). The articles defining short inter-pregnancy interval as < 6 months, 6-12 months, 12-18 months and 18-24 months or < 6 months, <12 months, <18 months and <24 months were included in this study. Studies that defined SIPI as > 24 months and those published in languages other than English were excluded.

Three internal reviewers were involved to decide about the study inclusion in final analysis. The detailed information is presented in Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram[12] **[Fig-A].** A total of 540 published studies were found initially, after careful screening only 15 studies were included in final analysis. In final table, study name, total sample size, percentage for short inter pregnancy interval were found in text or if it was not present in the text it was calculated as percentages or number of cases having short interpregnancy interval, which were calculated and taken in round number where needed.

Analysis plan and interpretations: Data was entered and analyzed in *MedCalc* to find pooled prevalence, to make forest plot and funnel plot. Both fixed and random effect model were used. The heterogeneity among studies was checked by I^2 statistics, whereas low heterogeneity was considered if I^2 < 25%, high heterogeneity was considered at I^2 > 75%.[13] Q test was also calculated and a p-value ≤0.05 was considered significant heterogeneity. Publication bias was assessed using the Egger's[14] and Begg's[15] tests. A *p*-value less than 0.05 were used to declare statistical significance of publication bias[16].

RESULTS

A total of 15 studies were finally taken in this meta-analysis with total sample size as (n = 12,840,062). Among these 15 studies, only 7 (46.67%) studies defined SIPI at < 24 months (the prevalence rate ranged from 17.3%[17] - 65.9%[5], 2(13.33%) studies took SIPI as < 18 months where they reported prevalence of SIPI was in between 35%[18] - 36.34%[19]. Two (13.33%) studies were found with definition of SIPI as < 12 months and they reported prevalence rate was from 2.2%[20] - 31%[21]. One study (6.67%) used definition as < 9 months and reported prevalence of SIPI as 4.8%[22]. Moreover, the definition of SIPI was taken < 6 months by 3 studies (20%), range of prevalence rate of SIPI was reported as 2.2%[23] - 5.4%[24]. Overall the prevalence of short interpregnancy interval was found as 2.2%[20,23] (defined at < 6 and < 12 months) to 65.9%[5] (defined as <24 months) in all included studies. All studies reported prevalence of SIPI but many of them did not follow the definition recommended by WHO i.e. (defined as < 24 months) i.e. by 8 studies (53.53%)[2].

The pooled prevalence of SIPI (defined at different intervals) was found as 7.85% (95% CI, 7.81%–7.91%) using fixed effects and was found as 24.10% (95% CI, 12.70%–37.80%) using random effect. There was high heterogeneity among the reported prevalence i.e., I^2=100% (> 75%) and also Q test was highly significant, p-value < 0.001. The heterogeneity was mainly due to inconsistent definitions of SIPI adopted in different studies. Moreover, the publication bias [Egger's test (73.5007) and Begg's test (0.1429)] was statistically insignificant, p-value > 0.05, showing that the published statistics did not influence the reported statistics.

Fig-A: PRISMA follow chart

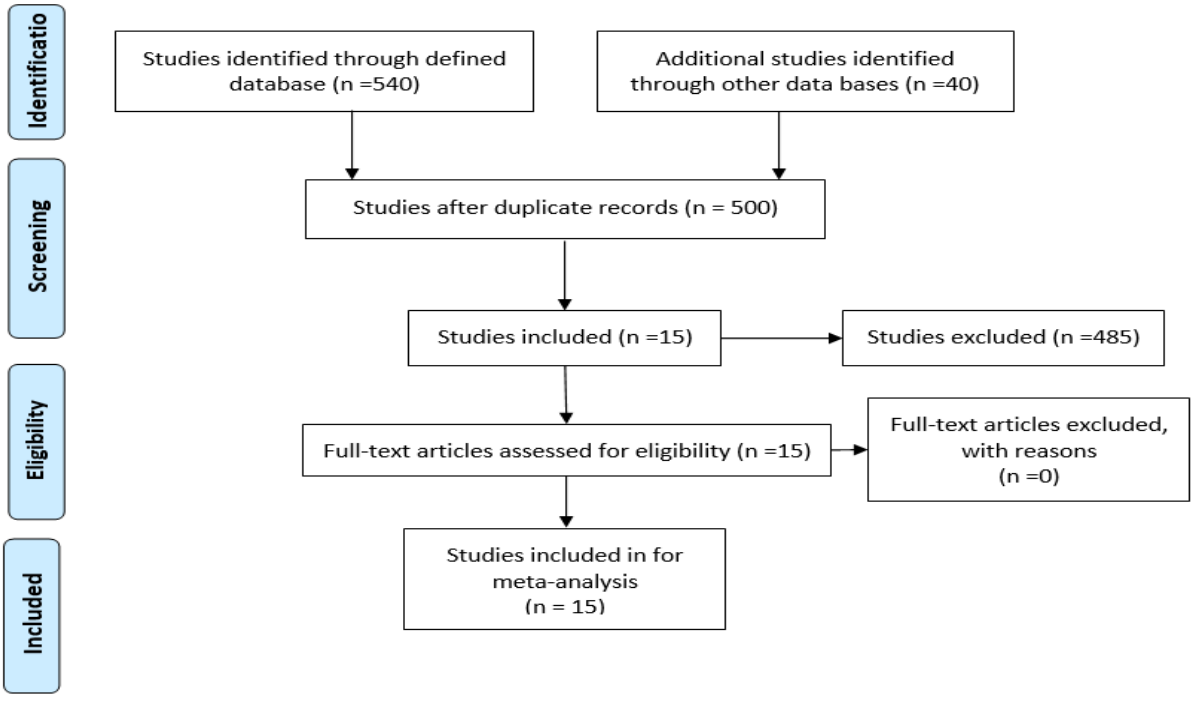

Fig.1: Forest and funnel plot using fixed and random effect methods

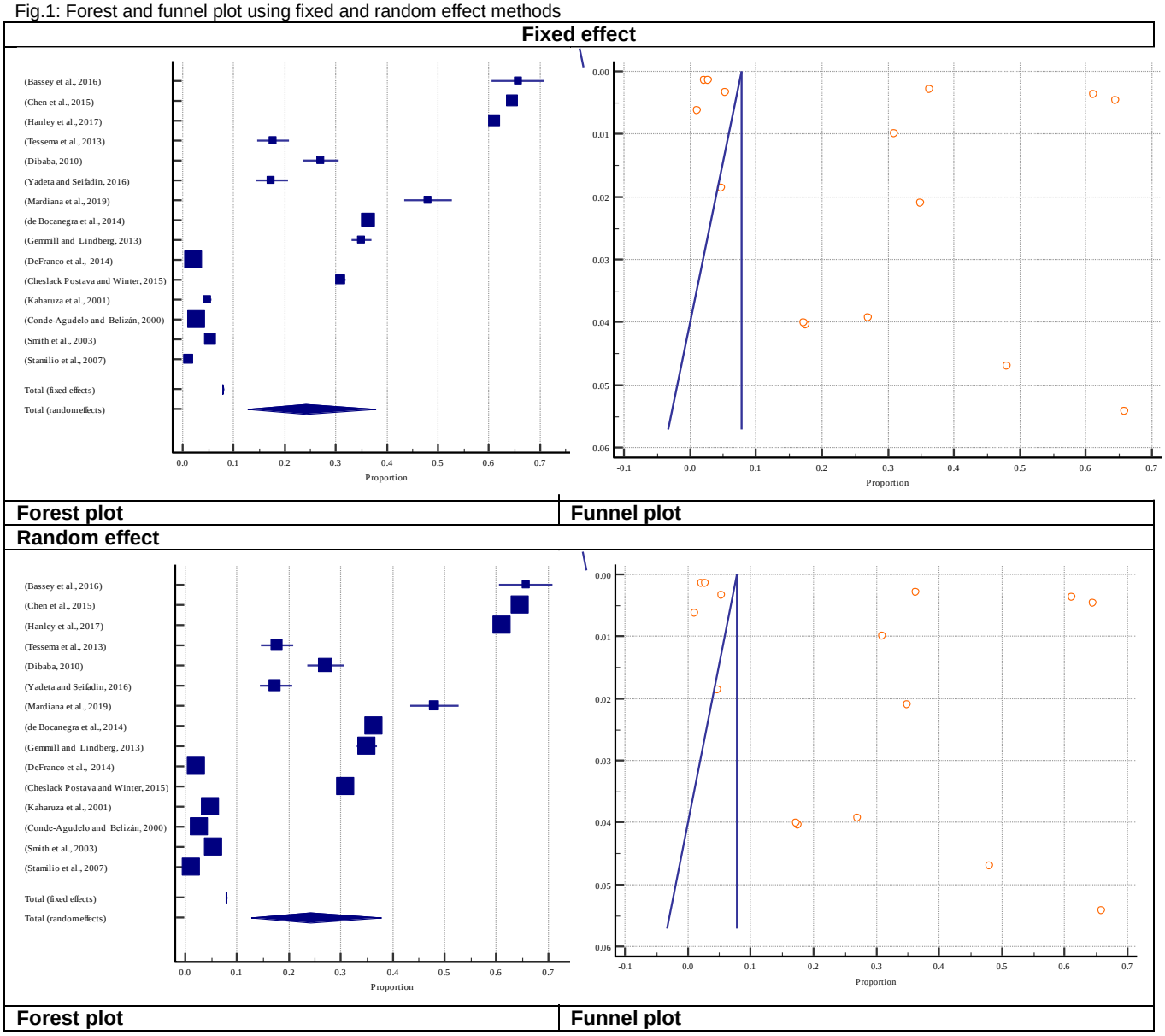

Table -1: Prevalence of short interpregnancy interval in different studies (at different definitions)

Study	SIPI (Months)	Total	n	Prevalence	95%CI	Weight	
						Fixed	Random
(Bassey et al., 2016)[5]	< 24	340	224	65.9%	60.57-70.91	0.027	6.62
(Chen et al., 2015)[25]	<24	46243	29846	64.6%	64.10-64.97	3.60	6.68
(Hanley et al., 2017)[26]	< 24	76356	46690	61.15%	60.80-61.49	5.95	6.68
(Tessema et al., 2013) [27]	<24	613	108	39.1%	14.68-20.87	0.048	6.65
(Dibaba, 2010) [28]	<24	645	174	27%	23.58-30.58	0.050	6.65
(Yadeta et al, 2016) [17]	<24	623	108	17.3%	14.44-20.54	0.049	6.65
(Mardiana et al., 2019) [29]	<24	452	217	48%	43.31-52.72	0.035	6.64
(de Bocanegra et al., 2014)[19]	< 18	117644	42761	36.34%	36.07-36.62	9.16	6.68
(Gemmill et al, 2013)[18]	< 18	2253	789	35%	33.04-37.03	0.18	6.67
(DeFranco et al.,2014)[20]	<12	454716	9808	2.2%	2.11 - 2.20	35.41	6.68
(Cheslack P et al, 2015) [21]	<12	10236	3173	31%	30.10-31.90	0.80	6.68
(Kaharuza et al., 2001) [22]	< 9	2904	139	4.8%	4.04 - 5.62	0.23	6.67
(Conde-Agudelo et al, 2000)[30]	< 6	456889	12793	2.8%	2.75 - 2.84	35.58	6.68
(Smith et al., 2003)[24]	< 6	89143	4816	5.4%	5.25 - 5.55	6.94	6.68
(Stamilio et al., 2007)[23]	< 6	25005	286	2.2%	1.02 - 1.28	1.95	6.68
Total (fixed effects)		**1284062**	**151932**	**7.85%**	**7.81 – 7.91**	**100**	**100**
Total (random effects)		**1284062**	**151932**	**24.10%**	12.70-37.80	**100**	**100**

a. Short interpregnancy interval defined at

Table -2: Test for heterogeneity and Publication Bias

Test for heterogeneity		**Publication Bias**			
Q test	**323795.3366**	**Egger's test**		**Begg's test**	
DF	14	Intercept	73.5007	Kendall's Tau	0.1429
p-value	P < 0.0001	p-value	0.1753	p-value	P = 0.4579
I^2 (inconsistency)	100.00%				

DISCUSSION

In recent decades, particular attention has been given to promotion of birth spacing for improving maternal and natal health in developing countries. The interpregnancy interval (IPI) has a pivotal influence on outcome of pregnancy and birth and thus relationship between the interpregnancy interval and perinatal health is receiving increasing focus.[31] In current meta-analysis, the prevalence of short interpregnancy interval was found as 2.2%[20, 23] (defined at < 6 and < 12 months) to 65.9%[5] (defined as <24 months) in all included studies. However, many of studies did not follow uniform definition of SIPI. [2] which might be a major reason of such a broad variation in reported prevalence.

Literature has established the negative role of SIPI with worse maternal, natal and infant health which is why advocators of family planning have always insisted on increasing the IPIs in order to improve the health of both mother and child. [32] The status of IPI among women with multiple parities, however, depends largely on age at first conception as well as cultural differences. In developing countries, for example, the average IPI is traditionally considered short even after two or three children. [33] Studies need to, therefore, prove authentically the impact of SIPI on poor pregnancy outcomes especially in settings with naturally low fertility and irrespective of births previously.[32]

The goal of appropriate interpregnancy interval can be effectively achieved through better family planning counseling focusing on awareness and clarifying the misconception regarding contraceptive methods. These counseling methods should target the women from vulnerable, marginalized communities according to their respective desires and needs[34]. Moreover, the accessibility for all women to contraceptive methods of all kinds suitable for individual needs must be available in healthcare facilities globally, including instantly after giving birth and no financial or cultural barriers should hinder this accessibility. Evidence suggests the role of gynecologists and other healthcare professionals in promotion of such policies is inevitable and effective[34] Moreover, it is responsibility of gynecologists/obstetricians to address the issues individually depending upon the needs and reproductive preferences of mothers[35]. For instance, if some couples show desire of conception in few months, it is responsibility of clinicians to provide them with preconception health and possible intervention for prevention of any related diseases. Similarly, for couples who want delayed conception ranging from several months to years, clinicians should work along in education regarding different options of contraceptive methods and help them choose the best suitable for their need and preference. In nutshell, inter-pregnancy interval is an important factor influencing feto-maternal health and role of healthcare providers is crucial in delaying IPIs and increasing birth spacing for improving these outcomes[35].

CONCLUSION

It is concluded that the pooled prevalence of short interpregnancy interval is considerably high. The studies had higher heterogeneity among published prevalence of SIPI mainly due to inconsistent clinical definitions. So, it is recommended to follow a standard definition of SIPI proposed by WHO to calculate prevalence for a better picture. Further studies can be designed to identify the reasons of short interpregnancy interval, so that the modifiable factors can be controlled to enhance the birth spacing. By making birth spacing appropriate, better fetal and maternal outcome can be achieved.

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