

Relationship between Unexplained Infertility and Sedentary Lifestyle among Women in the Urban City of Colombo; Infertile Female vs. Fertile Female

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Abstract - Infertility is defined as the absence of conception after 12 months of regular, unprotected intercourse. The objective of this study was to identify the relationship between unexplained infertility and sedentary lifestyle behaviour among the young female population in the urban city of Colombo. A case-control study was conducted among 250 women (125-fertile group/125- infertile group) in the age group of 18 – 32, who were clinically diagnosed with infertility and fulfilled the inclusion criteria at Infertility clinics and Gynaecology wards at 3 hospitals in the Colombo district. A convenient sampling method was used to recruit cases and controls upon completion of clinical diagnosis by the Visiting Obstetrician and Gynaecologist. The study tools and measurement tools were an interview-administered female infertility questionnaire form, International Physical Activity Questionnaire (IPAQ), Body Mass Index (BMI), and Skin Fold Thickness (SFT). Significant positive associations ($P < 0.05$) were explored between the obesity category and female infertility. There was a significant influence of over fat (30.4%) level measured using SFT for female infertility. A significant positive correlation ($P < 0.01$) was emphasized between the low level of IPAQ score (36.4%) and female infertility. Women aged ≥ 28 years, sedentary occupations, and age at menarche were found to be associated with infertility ($P < 0.01$). Sedentary lifestyle behaviour among women of reproductive age, living in the urban city of Colombo was found to be associated with female infertility.

Keywords: *unexplained infertility, international physical activity questionnaire, BMI (Body Mass Index)*

I. INTRODUCTION

Infertility is defined as the absence of conception after 12 months of regular, unprotected intercourse, (Larsen, 2005). Unexplained infertility is infertility that is idiopathic, meaning that the cause is unknown even after a thorough examination. Infertility affects 15 percent of reproductive-age couples worldwide. A 2006-2010 National Family Growth Survey study reported that in the United States, 6% of married females aged 15-44 years are infertile, and 12% have impaired fecundity, described as the inability to conceive and bring a baby to term. And also, in China, the prevalence of infertility was 25 percent among reproductive-age couples. Some research has shown that female infertility prevalence is comparatively higher than male infertility prevalence. (Sun et al., 2019) Any waking activity, such as sitting or leaning, with an energy expenditure of 1.5 metabolic equivalent task (MET) or less is considered as sedentary behaviour. Sedentary LifeStyle Behaviour causes infertility in women. Female infertility can be an outcome old enough, physical issues, hormonal issues, and way of life or natural components. Any condition that interferes with one or more of these factors will cause infertility. The relative prevalence of the aetiologies of infertility in a couple was defined by Burney et al in 2007. They revealed percentages are Male factor 25-40%, Female factor 45-50%, Both 10%, Unexplained 10%. The prevalence of the causes of female infertility are Ovulatory dysfunction 30-40%, Tubal/peritoneal 30-40%, Unexplained 10-15%, Miscellaneous 10-15%. The couple were never able to conceive in primary infertility and there is trouble in conceiving after once conceived in secondary

infertility. Our research mainly focuses on infertility and association of sedentary lifestyle among adult females in Sri Lanka. There are several studies done under sedentary lifestyle and infertility.

Gudmundsdottir, S. L., Flanders, W. D., & Augestad, L. B. (2009). Physical activity and fertility in women: doi:10.1093/humrep/dep337, Homan GF1, Davies M, Norman R. et al, Influence of lifestyle factors on fertility of the general population and those receiving fertility: a review. Kelly R. Evenson et al., (2016) conducted a study on the "Complex Relationship between Physical Activity and Infertility." They also consider a sedentary lifestyle as a potentially important, unexplored, volatile behavior that may be associated with infertility. In addition, they found that various types of physical activity (e.g., resting, caring for home, caring for a child or adult, transportation, work) or physical exercise (e.g. aerobic exercise, strengthening, mild effects) are differently related to infertility.

To attain our objective on how well the females are aware about their fertility difficulties, we will provide a standard questionnaire to females who are at Castle street hospital for women at Colombo, De Soysa Maternity Hospital for women at Colombo and Colombo South Teaching Hospital, Kalubowila.

The main objective of this study was to identify the association between unexplained infertility and sedentary lifestyle behavior among young female population in urban city of Colombo to assess and evaluate the fertility state of the case study and the control study population and to identify the association between unexplained infertility and sedentary lifestyle behavior among women in the urban city of Colombo.

One in four couples in the developing countries have been affected by infertility and 180 million couples are affected by either primary or secondary infertility in developing countries (WHO). The level of infertility care differs from Country to country such as level of education, economic and political situation of the country, reproductive health care, culture, also depends on number of hospitals and their quality, the available equipment and facilities and facilities to perform surgeries in complications, the level of maternity care (Ombelet et al., 2011).

II. METHODOLOGY

A case-control study was conducted among 250 women (125-fertile group/125- infertile group) in the age group of 18 – 32 years, infertile women who

were clinically diagnosed as infertility and fulfilled the inclusion criteria at Infertility clinics and Gynecology wards and 1st trimester pregnant mothers who fulfilled the inclusion criteria of the control study as fertile women at 3 hospitals in Colombo district ; De Zoysa Maternity Hospital, Colombo, Castle Street Hospital for women (Teaching) and Colombo South Teaching Hospital, Kalubowila. We got the participant characteristics for both case study and control study populations. Inclusion criteria for case study population is only female subjects, age group between 18-32 years, females who will give the consent only and females who not diagnosed a proper medical reason for infertility. Exclusion criteria for case study population is women diagnose with PCOS and other medical reasons, females with Family planning, females above age 32 years, females who will not give the consent, Illiterate females, females with mental illness and couples with infertility due to male partner's medical reasons. Inclusion criteria for control study population is only female subjects, age group between 18-32 years, females who will give the consent only and females with pregnancy positive. Exclusion criteria for control study population is females above age 32 years, females who will not give the consent, females who cannot read or write and females with mental illness. For the study, our sample size would be 125 infertile women as a control group and 125 fertile women as a case group who fulfill the inclusion and exclusion criteria. Since we do not have statistics from the prevalence of infertility among women in Sri Lanka, we referred to the journal article on, Safarzadeh, A., Ansari, H. and Arbabisarjou, A., 2016. Comparison the LifeStyle between Secondary Infertile and Fertile Women: Considering Potential Socio-Demographic and Reproductive Confounding Factors in A Case-Control Study. And we consider the same sample size for our study.

The patient who has fulfilled the inclusion criteria and been referred by the consultant will be included in the study. A consent form and the information sheet containing all the necessary information regarding the research will be provided to the participants in all three languages Sinhala, Tamil, and English. The information sheet contains the necessary details about the research, aim of the research, methods of the research, and ethical issues which will be protected throughout the research. Data collection will be performed under the supervision of the consultants, chief physiotherapist,

and the chief nutritionist in the hospital. Convenient sampling method was practiced to recruit cases/ and controls upon completion of clinical diagnosis by Visiting Obstetrician and Gynecologist. Demographic details and medical history of the women was collected in an interview-administered female infertility questionnaire form. To evaluate activity level, International Physical Activity Questionnaire (IPAQ) short form was used. IPAQ is validated in Sri Lanka by Dr. Charukshi Arambepola. For that granted permission from Dr. Charukshi Arambepola prior to use the IPAQ questionnaire. Height and weight were measured in all participants according to the standard methods then Body Mass Index (BMI) was calculated according to the standard equation and Skin Fold Thickness (SFT) was measured by using skin fold caliper. Data were statistically analyzed using SPSS software version 23.0 using Pearson Chi-Square test. Before conducting the data, collection and performing the test procedures on our study sample, a pre testing session was carried out to overcome the bias while performing tests and collecting data. This session was conducted using a randomly selected 10 infertile patients, from Colombo South Hospital, Kalubowila under the supervision of expert in the field of obstetrics and gynaecology. This procedure was mainly aimed to improve the accuracy and the quality of the study by familiarizing the researchers regarding the performance of the measures; BMI and SFT and Infertility Interviewer administered questionnaire and IPAQ (short form) we used it in categorical method. This helped the Investigators to overcome the possible inconveniences and bias that could arise during obtaining data from patients and throughout the study period.

III. DISCUSSION AND ANALYSIS

A. Socio - demographic characteristics of study population (n=250)

The study included 125 infertile females and 125 fertile females with the age of 18-32 years old. Sedentary life style among female groups based on age, occupation, ethnicity and religion.

As per age, majority of respondents (both infertile and fertile women) were in 28-32 years' age category. Majority of infertile population were sedentary occupation category (47.6%). Most of the participants are Sinhalese (Case- 46% and Control -

40.4%) with a majority of Buddhist. (Case- 40.4% and Control - 36.4%)

Table 01: Association of socio demographic characteristics with female regarding fertility state (n=250)

Characteristics	Category	Case - Infertile		Control - Fertile		P Value
		Frequency	Percentage (%)	Frequency	Percentage (%)	
Age	18 - 22 years	6	2.4	12	4.8	0.0486
	23 - 27 years	49	19.6	47	18.8	
	28 - 32 years	70	28.0	66	26.4	
Ethnicity	Sinhala	115	46	101	40.4	0.029
	Tamil	5	2	9	3.6	
	Muslim	5	2	15	6	
Religion	Buddhist	101	40.4	91	36.4	0.051
	Catholic	14	5.6	10	4	
	Hindu	5	2	8	3.2	
	Islam	5	2	16	6.4	
Occupation	Sedentary	119	47.6	45	18.0	0.000
	Non sedentary	6	2.4	80	32.0	

Below Table 2 demonstrate the frequency and percentages of case and control population's independent variables of the 250 cases which are including infertility interviewer administered questionnaire. Here we have mentioned independent variables: Age at 1st menarche, Interval between periods, regular or irregularity of menstrual cycle, contraceptive consumption and history of infertility.

When we consider about an age at 1st menarche according to the results among 125 of case study or infertility population, No one in the < 8 year category of age at 1st menarche, 50%(125) of infertility females are in the 8-16 years category of age at 1st menarche, and no one in the >16 years category of age at 1st menarche. And when we consider about the control study or fertile female population among 125, 1.6%(4) fertile females are in the < 8 year category of age at 1st menarche, 48.4%(121) of fertility females are in the 8-16 years category of age at 1st menarche, and no one of fertile females in the >16 years category of age at 1st menarche.

When we consider about an interval between periods, according to the results among 125 of case study or infertility population, No one in the less than 24 days category and 24-26 days category,

30%(75) of infertility females are in the 27-29 days category, 13.2%(33) are in the 30-32 days category, and 6.8%(17) are in the more than 32 days category. And when we consider about the control study or fertile female population among 125, No one in the less than 24 day category and 2.4%(6) of fertile females are in 24-26 days category, 40%(100) of fertile females are in the 27-29 days category, 4.8%(12) are in the 30-32 days category, and 2.8%(7) are in the more than 32 days category.

When we consider about regularity of menstrual cycle, according to the results among 125 of case study or infertility population, 26% (65) of infertile females are in irregular menstrual cycle category and 24% (60) of infertile females are in regular menstrual cycle category. And when we consider about the control study or fertile female population among 125, 8.4% (21) of infertile females are in regular menstrual cycle category and 41.6% (104) of infertile females are in regular menstrual cycle category.

When we consider about contraceptive consumption, according to the results among 250 of case and control population no one use combined hormonal contraception, Vasectomy, IUCD – Intrauterine Contraceptive Device and Depo - Provera. According to the results among 125 of case study or infertility population, 35.6% (89) of infertile females are not use any contraceptive method, 5.2% (13) of infertile females are using fertility awareness-based method and 9.2% (23) of infertile females are using male condom. According to the results among 125 of control or fertile population, 46% (115) of fertile females are not use any contraceptive method, 1.2% (3) of fertile females are using fertility awareness-based method and 2.8% (7) of infertile females are using male condom.

All those results are described below Table 02.

Table 02: Association of Fertility state of study population (n=250)

Independent variables	Categories	Cases- Infertile		Controls - Fertile		P
		Frequency	Percentage	Frequency	Percentage	
Age at 1 st menarche	<8 years	0	0	4	1.6	0.044
	8-16 years	125	50	121	48.4	
	>16 years	0	0	0	0	
Interval between periods	Less than 24 days	0	0	0	0	0.000
	24-26 days	75	30	100	40	
	27-29 days	33	13.2	12	4.8	
	30-32 days	17	6.8	7	2.8	

More than 32 days

Menstrual cycle	Irregular	65	26	21	8.4	0.000
	Regular	60	24	104	41.6	

Contraceptive consumption	1.No	89	35.6	115	46	0.000
	2.Fertility awareness-based method	13	5.2	3	1.2	
	3. Male condom	23	9.2	7	2.8	
	4.Combined hormonal contraception	0	0	0	0	
	5. Vasectomy	0	0	0	0	
	6. IUCD - Intrauterine Contraceptive Device	0	0	0	0	
	7.Depo Provera	0	0	0	0	
	8. Others	0	0	0	0	

B. Physical characteristics of study population (n=250)

BMI- Body Mass Index and SFT- Skin Folder Thickness were analyzed under the descriptive statistics of physical characteristics of the study sample. (n=250)

Descriptive statistics of mean values for BMI- Body Mass Index

Below table is mentioned the BMI classification according to the Sri Lankan cut off values which have modified by the Sri Lankan guideline committee. (Somasundaram et al. 2014).

Table 03. BMI classification according to the Sri Lankan cut off values which have modified by the Sri Lankan guideline committee

Nutritional status	Sri Lankan BMI cut off levels
Underweight	<18.5
Normal	18.5-22.9
Overweight	23.0-24.9
Obesity	Above 25

Mean of BMI of Infertility patients is 30.57 (SD - 3.05) and the mean of BMI of Fertility females - 23.87 (SD- 4.583). Mean value of the BMI of the case study population (Infertility females) is 30.57(SD=3.05). So that most of the infertile females are in obese category. Mean value of the BMI of the control study population (Fertility females) is 23.87(SD=4.583). So that most of the fertile females are in obese category.

Descriptive statistics of mean values for Skin Folder Thickness (SFT)

BODY FAT% MEASUREMENT CHART FOR WOMEN
SKINFOLD MEASUREMENT IN MILLIMETERS →

RESULT AGE	2-3	4-5	6-7	8-9	10-11	12-13	14-15	16-17	18-19	20-21	22-23	24-25	26-27	28-29	30-31	32-33	34-36
Up to 20	11.3	13.5	15.7	17.7	19.7	21.5	23.3	24.6	26.3	27.7	29.0	30.2	31.3	32.3	33.1	33.9	34.6
21-25	11.9	14.2	16.3	18.4	20.3	22.1	23.8	25.5	27.0	28.4	29.6	30.8	31.9	32.9	33.8	34.5	35.2
26-30	12.5	14.8	16.9	19.0	20.9	22.7	24.5	26.1	27.6	29.0	30.3	31.5	32.5	33.5	34.4	35.2	35.8
31-35	13.2	15.4	17.6	19.6	21.5	23.4	25.1	26.7	28.2	29.6	30.9	32.1	33.2	34.1	35.0	35.8	36.4
36-40	13.8	16.0	18.2	20.2	22.2	24.0	25.7	27.3	28.8	30.2	31.5	32.7	33.8	34.8	35.6	36.4	37.0
41-45	14.4	16.7	18.8	20.8	22.8	24.6	26.3	27.9	29.4	30.8	32.1	33.3	34.4	35.4	36.3	37.0	37.7
46-50	15.0	17.3	19.4	21.5	23.4	25.2	26.9	28.6	30.1	31.5	32.8	34.0	35.0	36.0	36.9	37.6	38.3
51-55	15.6	17.9	20.0	22.1	24.0	25.9	27.6	29.2	30.7	32.1	33.4	34.6	35.6	36.6	37.5	38.3	38.9
56&UP	16.3	18.5	20.7	22.7	24.6	26.5	28.2	29.8	31.3	32.7	34.0	35.2	36.3	37.2	38.1	38.9	39.5
	LEAN				IDEAL				AVERAGE				OVERFAT				

Figure 1. Skin Folder Measurements Scale

Source: Amazon.com

Mean value of the infertile or case population is 2.55. (SD=0.602) Among 125 of case study population high frequency of infertile females are distributed in overfat range and mean value of the fertile or control population is 1.62. (SD=0.982) Among 125 of case study population high frequency of fertile females are distributed in average range.

Descriptive statistics of IPAQ - International Physical Activity Questionnaire score (Short form)

Then we have categorized IPAQ results using categorical score given below Table 04.

Table 04. IPAQ – Categorical Score

Category	Intensity
Category 1	Low
Category 2	Moderate
Category 3	High

Analysis of IPAQ score and infertility relation, mean value of the IPAQ score of the case study population is 1.29(SD=0.489). Among 125 of case study population high frequency of females are distributed in low IPAQ score. Mean value of the IPAQ score of the case study population is 1.83(SD=0.416). Among 125 of case study population high frequency of females are distributed in moderate IPAQ score.

Finally, we demonstrate the IPAQ score levels of case study and control study population. According to that among 125 of infertility population 36.4% of infertility females are in the low level of IPAQ score,

12.8% infertility females are in the moderate level of IPAQ score and the 0.8% infertility females are in the high level of IPAQ score. So that there is a significant influence of low level of IPAQ score for infertility in females. And when we consider about the control study or fertile female population among 125 of fertile female population 9.2% of fertile females are in the low level of IPAQ score, 40.0% fertile females are in the moderate level of IPAQ score and the 0.8% fertile females are in the high level of IPAQ score. So that there is a high number of fertile females are in moderate level of IPAQ score.

Pearson correlation test was performed statistically to find out the relationship between BMI and infertility, SFT and infertility, and IPAQ score and infertility.

Table 05. Pearson correlation test to find out the relationship between BMI and infertility, SFT and infertility, and IPAQ score and infertility

Variable	P Value	Confidence Interval
BMI and Infertility	0.011	95%
SFT and Infertility	0.000	95%
IPAQ score and infertility	0.000	95%

BMI, SFT and IPAQ had significantly associated with infertility (P < 0.05). Significant positive correlations (P<0.05) were emphasized between obesity category of BMI and infertility in females. There was significant influence overfat (30.4%) category of SFT for infertile females. Significant positive correlations (P<0.01) were emphasized between low level of IPAQ score (36.4%) and infertility. Age at 1st menarche, interval between periods, regularity/irregularity of the menstrual cycle, contraceptive consumption family history of infertility had significantly associated with infertility. (P < 0.05)

C. Relationship between sedentary lifestyle behavior and unexplained infertility in women.

According to the IPAQ categorical score sample population we categorized as a sedentary and non-sedentary as below Table.05.

Table 05.

Life style behavior according to the IPAQ scores	Sample Population					
	Infertile - Case		Fertile Control		Total	
	Count	%	Count	%	Count	%
Sedentary	91	79.8%	23	20.2%	114	100.0%
Non-sedentary	34	25.0%	102	75.0%	136	100.0%
Total	125	50.0%	125	50%	250	100.0%

Then calculate the odd ratio. We can use an “odds ratio” to determine if there is a relationship between the infertile women vs sedentary life style behavior and the fertile women vs sedentary life style behavior. Odd ratio of the study population is 11.87. [log (11.87) =1.07] The odd ratio and the log (odds ratio) are like R-squared; they indicate a relationship between the infertility and sedentary life style behavior. In here odd ratio is 11.87. It’s a larger value. That mean the sedentary lifestyle behavior is a good predictor of unexplained infertility in women.

Pearson Chi-Square test was performed statistically to find out the relationship between sedentary life style behavior and infertility in women. In this case, p value is 0.000. (Significance level was defined as $p < 0.05$). So that p value is Since $p < .05$, there is a significant relationship and further need to investigate. According to the results of this study sedentary life style behavior was a significantly associated with infertility in women. ($P=0.000$, 95%CI – Confidence interval)

IV. CONCLUSION

The study concluded that significant positive relationships were emphasized between infertility and sedentary lifestyle behaviour including activity level, the study conducted a sample of 250 subjects (125-Infertile females and 125 – Fertile females) based on the inclusion and exclusion criteria. Significant positive Association ($P<0.05$) were explored between the obesity category and female infertility. There was a significant influence of over fat (30.4%) level measured using SFT for female infertility. A Highly significant positive correlation ($P<0.01$) were emphasized between low level of IPAQ score (36.4%) and female infertility. Women aged ≥ 28 years, sedentary occupations were found to be associated with infertility ($P<0.01$). The odd ratio and the log (odds ratio) are like R-squared; they indicate a relationship between the infertility and

sedentary life style behavior. In here odd ratio is 11.87. Though it’s a larger value, that mean the sedentary lifestyle behavior is a good predictor of unexplained infertility in women in urban city of Colombo. A highly significant positive relationship was determined between unexplained infertility and sedentary life style behavior. ($P<0.01$) Finally, we determined our primary objective which is there is a relationship between unexplained infertility and sedentary life style behaviour among women in urban city of Colombo.

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