THE STUDY OF FERTILITY AND ITS ASSOCIATION WITH SOCIO-DEMOGRAPHIC CHARACTERISTICS AND PHYSICAL ACTIVITY AMONG MARRIED FEMALES

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Abstract

Fertility rate in the world population is currently decreasing as compared to previous decades. There are many factors that can lead to the declining fertility rate especially the change in lifestyle and advancement of technology in the modern civilization. The association of fertility and physical activity of an individual in the occupational setting had frequently been highlighted in overall health and function of reproductive organs which can lead to successful pregnancy. This research was aimed to find the association of different socio-demographic characteristics and physical activity towards fertility among married female staff of various professions in IIUM Kuantan. **Methods:** A total of 92 respondents were involved in the survey based on the questionnaire with regard to socio-demographic information, fertility experiences, and physical activity routine. The respondents were selected from four different occupations in the International Islamic University Malaysia (IIUM) Kuantan Campus namely administrators, nurses, academics and cleaning and maintenance staff. **Results:** The results indicate that there were significant (P<0.05, 0.01, and 0.01) associations between occupation, educational level, and physical activity with fertility of the females. There was no association between the fertility age, income, and body mass index. **Conclusion:** This study demonstrated that occupation, education, and physical activity are significant factors that could be associated with female fertility. The practice of a healthy lifestyle and physical activity may be important factors contributing to increased chances of successful pregnancy.

Keywords: fertility, socio-demographic, physical activity, female, occupation, children.

INTRODUCTION

According to Frank (2017), a well-defined number of biological and behavioral factors are the result of demographically observed fertility or infertility. It mediates the influence of culture, society, economic conditions, living standards, and other similar background determinants on individual reproductive behavior. These biological and behavioural factors are called the proximate determinants of fertility and they are the factors that prove the social and economic environment can influence individual procreation. The level of fertility in the world varies by country, culture, social, economic conditions and individual characteristics such as age. The more industrialized and economically developed societies have lower fertility than less developed societies that works in agricultural sector. Furthermore, more educated groups with high incomes have lower fertility than less educated groups with low incomes. This is because they have improved their living standards, and nations have become more economically stable with improved health conditions.

The World Health Organization (WHO 2020) defines the total fertility rate (TFR) as in simple term that refers to the total number of children born or possibly to be born to a woman in her life time and the women must be subject to the prevailing rate of age-specific fertility in the population. In relation to this, infertility is a reproductive system disease caused by the inability to have a clinical pregnancy after 12 months of regular unprotected sexual intercourse. Infertility is possibly caused by genetics, general health, fitness, diseases and dietary factors (Arnarson, 2017). Risk factors and also unexplained causes for infertility are known to increase in women over the age of 35 (Lindsay & Vitrikas, 2015). A review by Harris, et. al. (2011) however reported the increase of fertility rate of men in their 30s by 21% and an even higher rate of 30% for men above 40 years of age. Interestingly, it was found that the fertility rate in men below 30 has decreased by 30%.

Infertility affects couples with impaired ability to get pregnant and it includes women who are unmarried thus the numbers could be undervalued (Lindsay & Vitrikas, 2015). The female hormonal cycles play a crucial role in the achievement of pregnancy and the process of carrying the baby to term. The cycle is about twenty-eight days with a five days fertile period but could potentially diverge to a great extent from this standard. Hormonal cycles in women determine whether they can achieve pregnancy or otherwise. The cycle is about twenty-eight days with a five days fertile period but could potentially diverge to a great extent from this standard (Takahashi & Johnson, 2015). Although the female ovarian conserve determines the couple's per cycle fecundity, the increase in fertility in men as they progress in life as opposed to women remains a question as aging in men is frequently associated with decreased semen quality and increased time to conception (Harris, et al., 2011).

Bae, et al. (2018) stated that the important indicator of a healthy women's reproductive system is a regular menstrual cycle which relate to the function of a variety of hormones. Obesity, stress, and smoking are among the factors that are associated with irregular menstrual cycle and early menopause. Anovulation is a major symptom of an irregular menstrual cycle and it may also lead to the decrease in ovarian steroid secretion and production. It is also stated that the most important cause of irregular menstrual cycle is related with functional hypothalamic amenorrhea that corresponds to a low gonadotropin-releasing hormone secretion and hypothalamic-pituitary-adrenal (HPA) axis dysregulation. These phenomena will cause many chronic diseases such as infertility, heart disease, and type-2 diabetes. It has also been proven that the female hormone levels are connected with stress, obesity, and health behaviours. Increased levels of anxiety and depression have been demonstrated in women who are infertile indicating that both conditions

including stress may be main factors of not being able to procreate (Rooney and Domar, 2018). Programmes to alleviate stress would perhaps pay a role in increased pregnancy rates.

MATERIAL AND METHODS

The convenience sampling method was used in this study. The survey based on questionnaire was given after receiving consent from all respondents. Explanation on the research that included the overview of this study and additional information were relayed to all participants for more reliable and responsive data. The sampling was done amongst IIUM Kuantan staff and respondents included academics, nurses, supporting staff and administrators for purposed of comparison of the level of significance from each group. Data was collected by a questionnaire that consists of three parts that included questions for socio-demographic information, fertility experiences and physical activities. The socio-demographic questions investigated the background of the research subjects and fertility experience questions that were based on the Fertility Experiences Woman's Questionnaire determined menstrual history, family planning and numbers of offspring. Levels of physical activity of subjects were explored using the International Physical Activity Questionnaires (IPAQ) that enquired on daily physical activity routine. The questionnaire outline included, 1) Demographic (age, sex, weight, height, education, income & occupation, 2) Physical activity (walking, moderate-vigorous physical activity in minute/week, and 3) Fertility status (number of offspring, duration to get pregnant/attempts to conceive, menstrual history, sexual history, confounding factors).

In this study, the total physical activity calculation formula that make use of the metabolic equivalent of task (MET-minutes/week) was used. The MET-minute scores are equivalent to kilocalories for a 60-kilogram person and it is a multiple of estimated resting energy expenditure. The subjects that had less than 600 MET-minute/weeks were considered as low physical activity subjects while the subjects that had more than 3000 MET-minute/week were considered as those with high physical activity. The Figure 1 shows a formula selected on how the total physical activity based on the unit MET-minutes/week was calculated for the group on subjects in this study.

- Walking MET-minutes/week = 3.3 × walking minutes × walking days at work
- Moderate MET-minutes/week= 4.0 × moderate-intensity activity minutes × moderate days at work
- Vigorous MET-minutes/week= 8.0 × vigorous-intensity activity minutes × vigorous-intensity days at work
- Total physical activity MET-minutes/week= sum of Walking + Moderate+ Vigorous MET minutes/week scores at work

Figure 1. Guidelines showing MET values and formula for calculation of MET-minutes for subjects in the work domain (IPAQ, 2005)

The Statistical Package for Social Sciences (SPSS) software version 12.0 was used to find out the association of three main variables which were the fertility level, physical activity and socio-demography of the subjects. Numerical variables were re-categorized into categorical data to be

analyzed by one-way analysis of variance (ANOVA) and Chi-square test with 95% CI (P<0.05). For non-parametric data, Kruskal Wallis test was and the fertility level was assessed by the number of the children.

RESULTS

Based on the Table 1, respondents that did not practice contraception, within the age of 26 - 30 years old had the lowest number of children while respondents aged 46 to 50 have the highest number of children. The statistical analysis showed no association between number of children and age groups.

Table 1 Number of children of women using no contraceptives in different age group

Age group	Number of children (Mean ±SD)	F	P-value
21-25	1.5 (0.71)		
26-30	1.29 (1.1)		*NS
31-35	2.14 (1.68)	1.448	0.244
36-40	4.25 (2.06)		
41-45	3.0 (1.73)		
46-50	2.57 (2.64)		

N = 92, **NS* indicates statistically not significant

According to the Table 2, there was significant association between number of children and education among respondents that did not use any contraceptive with a p-value of 0.014. The median number of children decreased significantly as the education level increased. Respondents that had at least Master degree indicated the lowest number of children produced.

Table 2 Education level of women and number of children using no contraceptives

Education	**Median (Children)**	**IQR**	**P-value**
<Secondary School	12	3.75	
Diploma	7	2.00	0.014*
Degree	6	4.25	
>Master	5	2.00	

N=92, *P<*0.05* indicate statistically significant

The association of number of children with occupation among female IIUM Kuantan staff was showed in the Table 3 There was a significant association between the number of children and occupation. Results indicated that the cleaner workers produced the highest median number of children as compared to other workers with 13 children among this group of respondents. Administrators and nurses demonstrated the lowest median number of children produced with only 5 children for each group surveyed.

Table 3. Occupation of women and number of children using no contraceptives

Occupation	**Median (Children)**	**IQR**	**P-value**
Administrator	5	1.50	
Nurse	5	3.00	0.002*
Academician	7	2.00	
Cleaner	13	3.50	

N=92, *$P<0.01$ indicates statistically significant

The Table 4 indicates that respondents with highest income (>RM4000) had the lowest mean number of children of 0.83 as compared to others. Subjects from the lowest income group (<RM2000) however demonstrated the highest mean number of children at 3.31. This study showed no significant association between number of children with income as the p-value is 0.059.

Table 4 Income status of women and number of children using no contraceptives

Income	Number of Children Mean (SD)	F	P-value
<RM2000	3.31 (2.21)		*NS
RM2000-RM2999	2.29 (1.39)	2.812	0.059
RM3000-RM3999	1.8 (1.71)		
>RM4000	0.83 (0.98)		

N = 92, **NS* indicates statistically not significant

The body mass index (BMI) variable is related to the weight and height of an individual and is considered to be an indicator of body fat and future health risks. BMI of subjects in this study indicated no significant association with the number of children as shown in Table 5. For the distribution of BMI among the IIUM Kuantan staff surveyed, the supporting staff had the highest number of respondents that belonged to the overweight and obese group followed by academics, nurses and administrators with a record of 12, 11, 9 and 5 individuals respectively. Some missing data were noted with this variable due to non-response.

Table 5 Body Mass Index (BMI) status of women and number of children using no contraceptives

BMI	Number of Children Mean (SD)	F	P-value
Underweight	2.0 (0)		*NS
Normal Weight	2.35 (1.81)	0.288	0.834
Over-weight	2.4 (1.64)		
Obese	1.94 (1.52)		

N = 92, **NS* indicates statistically not significant

The significant association between number of children and physical activity level with p-value of 0.001 is shown in Table 6. Subjects from the low physical activity group indicated the lowest median number of children while subjects from the high physical activity group had the highest median number of children. The Table 7 lists the findings of the levels of physical activity done by the women from every group investigated in this research.

Table 6 Physical Activity status of women and number of children using no contraceptives

Physical Activity	Median (Children)	IQR	P-value
Low	9	1.50	
Moderate	7	3.00	0.001*
High	14	3.25	

N = 92, *$P<0.01$ indicate statistically significant

Table 7 Distribution of Walking, Moderate Physical Activity and Vigorous Physical Activity Based on Occupation

	Administrator (n=23)	Nurse (n=23)	Academician (n=22)	Supporting staff (n=24)	Total (n=92)
Walking (in MET minutes/week)					
					p=0.00*
<500 MET	8 (34.8)	8 (34.8)	11 (50)	0	27 (29.34)
500-1000 MET	9 (39.1)	7 (30.43)	5 (22.73)	0	21 (22.83)
1000-1500 MET	3 (13.04)	4 (17.4)	2 (9.1)	0	9 (9.8)
>1500 MET	3 (13.04)	4 (17.4)	4 (18.2)	24 (100)	35 (38.04)
Moderate physical activity-carrying light loads, bicycling at regular pace, double tennis (in MET minutes/week)					
					p=0.00*
<500 MET	17 (73.91)	20 (86.96)	21 (95.45)	5 (20.83)	63 (68.5)
500-1000 MET	3 (13.04)	1 (4.35)	1 (4.55)	5 (20.83)	10 (10.87)
1000-1500 MET	1 (4.35)	1 (4.35)	0	13 (54.2)	15 (16.3)
>1500 MET	2 (8.7)	1 (4.35)	0	1 (4.2)	4 (4.35)
Vigorous physical activity-heavy lifting, digging, aerobics, fast bicycling (in MET minutes/week)					
					p=0.00*
<500 MET	20 (86.96)	22 (95.65)	21 (95.45)	7 (29.17)	70 (76.1)
500-1000 MET	3 (13.04)	1 (4.34)	1 (4.54)	8 (33.33)	13 (14.13)
1000-1500 MET	0	0	0	9 (37.5)	9 (9.8)
Sitting (in hours)					
					p= 0.00*
<2 hours	12 (52.2)	5 (21.74)	2 (9.1)	20 (83.33)	39 (42.4)
2-4 hours	7 (30.43)	12 (52.2)	13 (59.1)	2 (8.33)	34 (36.96)
4 hours	4 (17.4)	6 (26.1)	7 (31.82)	2 (8.33)	19 (20.65)

N=92, *$P<0.01$ indicate statistically significant

DISCUSSION

Based on earlier researches, it has been always observed that the delay of marriage, adverse economic and institutional factors can give a significant contribution to the rise in the levels of infertility in a developed country according to Pinnelli and Cesare (2005). Nevertheless, the results in this study indicated that the respondents reaching the age of 50 had a higher number of children compared to the respondents within the 20- to 30-year-old bracket, thereby not able to support the justification by Harper et al., (2016) that female fertility decreases with age. Moreover, the results attained showed no significant relationship between the number of children with the age of the respondents. This was possibly because of the sample size that had influenced the accuracy of the results.

This study however showed that there is significant association between education levels of the respondents with the number of children. The subjects that had at least a Masters degree showed lowest median number of children than other subjects. The median of children also showed a decreasing trend as the education level of the groups of the respondents increased. The results obtained concur to that in the study done by Bailey, Guldi and Hershbein (2013) that stated mothers with higher education background are more likely to delay household formation, motherhood, and childbearing within marriage. According to Kravdal and Rindfuss (2008), women with better education have later first births and stay childless more often than less formally educated women.

In this research, the cleaner workers produced the highest median number of children as compared to other workers with 13 children followed by academics with a median of 7 children. Administrators and nurses showed the lowest median number of children produced with only 5 children. There is no feasible explanation for this disparity and fertility behavious but perhaps the higher number of children belonged to those who are at alater age as compared to those women whom are much younger. This interesting aspect was shown by Begall and Mills (2012) in their study that demonstrated women in more communicative jobs such as healthcare and teaching are found to have faster transition to first births when compared with women in technical and economic jobs.

Monthly income, industrialization and economic growth influence rapid decline in fertility giving rise to a situation in which high income and great wealth were commonly associated with low fertility (Kreyenfeld et al., 2012). Although not significant, the results in this study related to the income demography, showed that respondent with highest income (>RM4000) had the lowest mean number of children produced while subjects from the lowest income group (<RM2000) showed the highest mean number of children. It is noted that the distribution of the respondents which was not balanced may have an effect on the accuracy of the results. The number of respondents collected from high professions in IIUM Kuantan was very low compared to other professions in this study.

In this study, the weight and height of the respondents were collected to calculate their Body Mass Index (BMI) in order to find the association with fertility in terms of the number of children. Based on the results, there was no significant relationship of BMI with the number of children belonging to the subjects. Although a high BMI is frequently associated with infertility, it is recommended that body composition be explored further as it gives a better estimate of fitness level

and health risk (Foucaut et al., 2019). Nevertheless, many systematic review and meta-analysis studies have proven that weight-loss interventions in the prevention of obesity such as diet and exercise can improve pregnancy rates and ovulation process (Best, Avenell, & Bhattacharya, 2017). Moderate physical activity is also related with a little boost in fertility regardless of BMI indicating that physical activity may have influence in improving fertility among overweight and obese women which at higher risk of infertility. Lean women who surrogate energetic physical activity with judicious physical activity could also increase their fertility (Wise et. al, 2012).

Significant association of physical activity towards the number of children by the women surveyed was demonstrated in this study. A similar research done by Mckinnon et al., (2016) stated that vigorous physical activity can improve fertility among overweight and obese women and moderate physical activity can increase fertility among all women. The higher median number of children for the group with the highest physical activity as opposed to that of the group with the low physical activity in this research may indicate that work-related intensity of movement and the nature of the work itself may have a bearing on the capacity to produce offspring

This study also managed to analyses the duration of walking, moderate physical activity, vigorous physical and sitting time among female IIUM Kuantan staff from the different types of occupation. Subjects who worked as supporting staff had the highest percentage among them that walked more than 1500 MET-minutes/week as all of them were involved in cleaning work that required a lot of movement. However, about half of the academics surveyed had less than 500 MET-minutes/week of walking (50%). For vigorous physical activity such carrying heavy loads and fast cycling, supporting staff recorded the highest percentage among them involved in more than 1000 MET-minutes/week of vigorous physical activity (37.5%). For sitting time per day, 59.1% of the academics recorded the highest percentage of person that had more than 2 hours of sitting per day and 31.82% of them also had more than 4 hours of sitting in one day as compared to the supporting staff where only 16.67% of them had more than 2 hours of sitting per day. It was observed that here was not much difference in terms of physical activity level between the nurses and administrators.

Moreover, physical exercise also proved to improve mental health of the mother which is important in controlling stress and anxiety. The mother's state of mind is very important in the development of the baby as stress, anxiety and depression could give negative effect on pregnancy which will then lead unsuccessful pregnancy. It has been demonstrated that stress can affect the production of important hormones needed in pregnancy such as relaxin, progesterone, follicle-stimulating hormone (FSH) and oxytocin according to Ratey and Hagerman (2013). Ovulation in menstrual cycle depends on the hormones regulation in women where progesterone, oestradiol inhibin A, and luteinizing hormone (LH) are involved in this process as stated by Mihm, Gangooly, and Muttukrishna (2011). Thus, in relation with physical activity, as per Ratey and Hagerman (2013) concluded, physical exercise may improve hormone secretion in women, and it may the most important factor in determining the menstrual length and fertility of women.

CONCLUSION

This study demonstrated that occupation, education, and physical activity are significant factors that are associated fertility. The practice of a healthy lifestyle and physical activity may be important factors contributing to increased chances of successful pregnancy.

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