Childbearing Probabilities during the First Years of the Marriage among Egyptian Women using Survival Analysis Techniques

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Abstract

Prolonging the period between marriage and the first birth reduces the effective age of childbearing in a woman and thus fewer children during her life. This paper aimed to study the interval between the beginning of the marriage till the conception of the first birth in terms of the length of this interval, childbearing probabilities, and the determinants that had a significant effect, for two groups of women, the first is for women who got married in the period that was characterized by a high total fertility rate. The second included the women who married during periods that were characterized by an acceptable downward trend in fertility rates. The life table, Cox Proportional Hazard Model, and the Egypt Demographic and Health Survey for the year 2014 were used. The results showed a decrease in this interval in the first group, as compared to the second group. The differences between the two groups appeared slight in terms of the childbearing probabilities. There was no difference between the two groups in terms of the variables with a significant effect during that interval. According to Cox's analysis, the woman's education level, age at her first cohabitation, and the previous use of family planning methods are the only significant variables. It is necessary to raise and spread awareness about the married couples' need of getting reassured about the continuation of their marriages before deciding to have a child. This aims to reduce the effective age of a woman's ability to bear more children.

Keywords: Childbearing probabilities; first birth interval; Egyptian women; life table; Cox Proportional Hazard Model; parity progression ratio.

Introduction

By the end of 2021, the population of Egypt reached 102.7 million (CAPMAS), and it is expected to reach 121 million by 2030 according to the United Nations' projections (Nations, 2019). Thus, Egypt is one of the countries with high fertility rates despite the significant decline in it, which reached 3.3 children per woman at the end of her reproductive life in 2018 as compared to what it was in the sixties with 6.7 children per woman, and the pattern that continued to decline, reaching 5.6 at the end of the seventies, 4.8 at the end of the eighties, 3.4 at the end of the nineties, 3.2 in 2003 (El-Zanaty & Way, 2006), and 3 in 2007. It, then, had the opposite trend as it showed an increase in fertility (Sayed, 2019) that affected all segments of the population (Goujon & Al Zalak, 2018) since it reached 3.4 in 2014, according to the World Bank estimates (Alemu & Gobena, 2022). With a direct connection between the fertility levels, population, policies, and programs in the country (UNFPA, 2017), this population explosion is considered as a more serious threat than terrorism that Egypt has been subjected to in recent years, according to the description of President Abdel Fattah El-Sisi. It is also a threat to socio-economic development (Ambrosetti, Angeli, & Novelli, 2019), and one of the challenges that the country is facing to achieve the 2030 sustainable development plan (Ghanem, 2012).

However, the intensive efforts, which have been made by the government in recent years, have led to a qualitative transfer in studying the population of Egypt and the development situation. These outcomes have emerged as a result of achieving an economic growth rate of 5.6%, which is close to three times the population growth rate of 1.88% (Sayed, 2019). Maintaining that relationship, if not improving it, is an issue that requires a continued decline in the fertility rates, where fertility plays a key role in population growth (Miri & Moghadam, 2018). This decline in fertility rates provides an opportunity for low-income countries to achieve rapid economic growth (UNFPA, 2014).

Accordingly, identifying the determinants of fertility and the role of each in every period is a necessary requirement for policy and program makers. Studies have proved that fertility is correlated to the level of education, residence, participation in the workforce (Chernet, Shebeshi, & Banbeta,

2019) (Tosun & Yang, 2018), age at the time of the marriage, use of contraceptives (Chernet et al., 2019), wealth index, family size, age, gender of the first birth, marital status (Tosun & Yang, 2018), regularity of the menstrual cycle (Shayan, Ayatollahi, Zare, & Moradi, 2014), the efficiency of the national family planning program (Sayed, 2019) (Shoieb, 1998), and the interval between the beginning of the marriage and the first birth (Luc, Thang, Swenson, & San, 1993).

Throughout the ages, for any married couple, the event of having the first birth, coming out alive, has been considered by Egyptian culture, to be one of the most important events that not only both spouses aspire, but also both their families. This is regarded as evidence of the fertility of both spouses. This also proves the ability of a woman to successfully complete the pregnancy period and end it with a living child. This matter causes the woman to gain early empowerment, which in turn is related to later empowerment (Goleen Samari, 2017).

Besides, Egyptian society is one of the societies in which the percentage of women participating in the workforce (24%) is low (BANK, 2021). In such societies, employment plays an important role in fertility (Krafft, 2020). It is found that the females, in their twenties, who are highly educated, lack job opportunities (Zalak & Goujon, 2017), given that most of the available jobs have no benefits or security. This is because these jobs are available through unofficial sectors in the state (Assaad & Krafft, 2015) (Goujon & Al Zalak, 2018) in light of the lack of job opportunities in the public sector and the insufficient private or formal employment sector (Zalak & Goujon, 2017). The newlywed women's keenness to have children as soon as they get married is considered as a kind of security (El-Zeini, 2008) (G. Samari, 2017).

The previous factors contribute to the inclusion of Egypt in the list of countries in which the period between the beginning of the marriage and the first birth is short (Eltigani, 2000) (G. Samari, 2017). Prolonging that period diminishes the woman's childbirth probability in her subsequent years and thus reduces the number of children she can have during her life (UNFPA, 2011). This period may also get affected by several factors, some of which may have negative effects on both the mother and the child. For instance, (Hofferth & Reid, 2002) proved that women, who had delayed their first

births, their children did not suffer from behavioral or academic achievement problems.

When a mother gave birth to her first birth at an early age, for example, teenage childbearing, this reduced her probability of completing high school and completing some college, as compared to the women who gave birth at the age of 30 or older (Hofferth, Reid, & Mott, 2001). Moreover, the children born to young mothers received fewer resources than those born to older mothers (Hayford, Guzzo, Kusunoki, & Barber, 2016).

Therefore, this study targeted the interval between the beginning of the marriage and the first birth with a focused on the length of this period, childbearing probabilities, and the determinants that had a significant effect, for two groups of women, the first is for women who got married in the last ten years before the survey (2004-2014) It is the period that started with a very slow decline in the total fertility rate and then, a rise in the last six years, after it was taking an appropriate downward trend (Sayed, 2019). The second included the women who had been married for more than ten years and who married during periods that were characterized by a significant decrease in fertility rates. The aim was to find out whether there was a difference or not in those aspects in the two periods. Controlling the factors, affecting that interval influences the reduction of the childbearing probabilities. Consequently, this can prolong that interval, which may contribute to reducing the fertility levels and overcoming one of the obstacles of creating a suitable environment to achieve the development plans.

Literature Review

The researchers studied the first birth interval around the world in terms of its duration, the surrounding factors that may have an impact on that period, and the consequences of prolonging or reducing it. These factors play a very important role in influencing the level of fertility and consequently the size of the population in the community.

(Dehesh, Malekmohammadi, & Dehesh, 2022) investigated the factors associated with the time of the first-birth (FBI) in Iran by using multivariate Cox regression. This study concluded that the average of FBI is 2.5 ∓ 0.8 years. Woman's & husband's age at marriage, age at the first menstruation, rural residents, and having engagement period were associated with short FBI.

woman's Body mass index, Woman's & husband's university educational level, contraception use, and income sufficiency were associated with long FBI.

In a study about prevalence and risk factors of short birth interval (SBI) in Bangladesh by (Islam, Islam, Rahman, & Khan, 2022), it was found that the prevalence of SBI was lower among women of relatively high ages, residing in the households headed by a female, and of the richest wealth quintile.

Also in a study about determinants of short birth interval among ever married reproductive age women in Eastern Ethiopia by (Roble, Osman, Ibrahim, Wedajo, & Abdi Usman, 2021), it was found by Binary logistic regression that short birth intervals were associated with educational level of the women, sex of the baby, husband marriage types, history of neonatal death, and contraceptive utilization.

Furthermore, a study by (Obite, Bartholomew, Nwosu, Anyiam, & Aminu, 2021) , about the effect of various socio-demographic and cultural factors on the interval between marriage and first birth in Nigeria revealed that the interval of marriage to first birth is 23.90 months. Women who married early, and muslims have longer first birth interval. Women with primary and secondary education, with early first sexual intercourse, and ever used contraceptive method have short first birth interval. Residence and husband's education has no statistically significant effect.

Determine the study variables according to Literature Review

In order to choose the variables for this study, the researcher referred to those studies to find out two aspects. The first aspect was to identify the variables of each study that the researchers subjected to statistical analysis in this regard and their presence in each. The second was to identify the variables that have a significant effect on the aforementioned period.

In terms of variables that the researchers subjected to statistical analysis to determine the significant determinants of that period, it was found that these variables in most studies were: the woman's age at the time of the marriage, her level of education, the type of her residence, her work status, her husband's level of education, the region, wealth index, and her religion. In addition, it was noticed that the variables with less presence in the studies as compared to those forenamed were: the knowledge of the woman's ovulatory

cycle, her profession, her husband's profession, her previous use of any contraceptive method, her previous miscarriage, and her age at her first sexual intercourse.

Moreover, it was found that some other variables had been limitedly employed by researchers, such as the spousal age difference, the age of the woman at the time of her first birth (Alam, 2015), the exposure to mass media (Rahman, Mustafi, & Azad, 2013), the woman's decision-making abilities, encountering domestic violence by her husband (MacQuarrie, 2016), the man's age at the time of the marriage, the time interval between signing the marriage contract and the wedding ceremony, the family's monthly income, the insurance coverage, and the type of the marriage (Miri & Moghadam, 2018).

As for the significance of the variables, it was noticed that the results of those studies did not agree on the factors that are considered to have a significant impact on that interval. The education levels of women had a significant effect on that interval according to (Alam, 2015), (He, 2020), (Logubayom & Luguterah, 2013), (MacQuarrie, 2016), (Rahman et al., 2013), (Saadati, Bagheri, & Abdolahi, 2018), (Shoieb, 1998), but (Hailu, 2015), (Mubiru, Atuhaire, Lubaale, & Wamala, 2016) found that those levels of education did not have a significant effect.

Although this difference may be due to the different nature of those societies, the results of those studies must be taken into consideration when studying the factors associated with that period in other societies.

Methodology

Data sources

The study was based on data from the Egypt Demographic and Health Survey (EDHS) for the year 2014 (Health, Population, Associates, & International, 2015). The study sample was conducted on 19,057 women who have been married only once, aged between 15-49 years at the level of the Arab Republic of Egypt (excluding North and South Sinai governorates). They were divided into two groups: 8680 women who got married in the ten years prior to the survey, and 10377 women who had been married for more than ten years.

Variables and measurements

In this study, the dependent variable is the duration between the beginning of the marriage and the first birth (the duration variable), as expressed in months. All women, and who had a negative interval before their first birth, had been excluded from all analyses. The period of fewer than seven months for having the first birth was included in the analysis. As for the independent variables, they are: cultural factors (type of residence), socio-economic factors (the woman's educational level, the husband's educational level, the woman's current employment status, and the wealth index), and demographic factors (the woman's previous use of contraceptives: any method after marriage and her age at her first cohabitation: she started living with her first husband).(Figure 1)

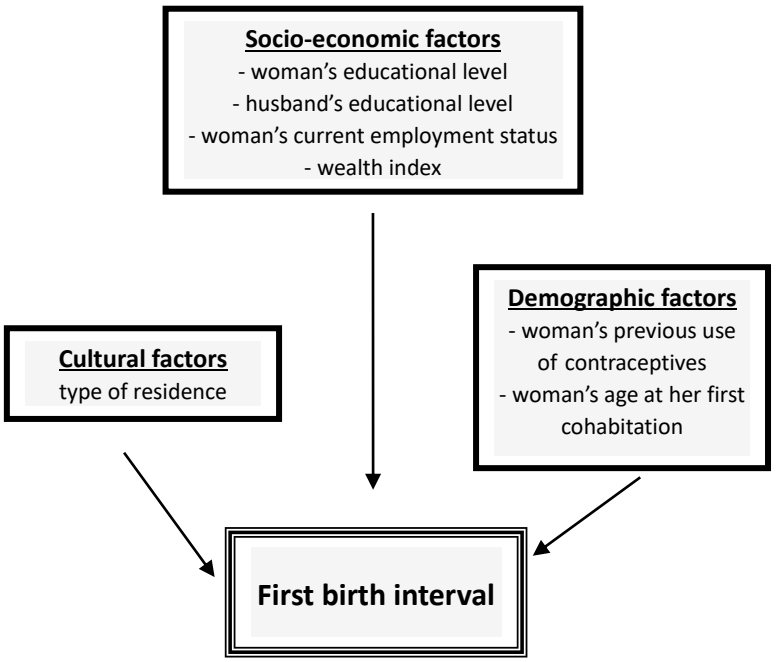

Figure 1. The relational framework for the study variables.
Source: Created by the researcher

Data analysis

A life table was used as a non-parametric survival analysis technique to identify the Egyptian women's childbearing probabilities during the first years of the marriage by calculating the parity progression ratio (PPR). The Cox Proportional Hazard Model was also used as a semi-parametric to evaluate the effect of multiple determinants on the interval under research in this study. The analysis of this study was carried out using SPSS-24.

Results

Life table

The information presented in Table 1 shows that there is a slight increase in the percentage of the woman's probability of having her first birth during the first three years of the marriage for the second group of women compared to the first group.

The rural women had a higher probability of having their first births during the first three years of the marriage than the urban women. In addition, the probability of childbearing decreased more among the working women than among the non-working women, for both groups under research in this study.

Parity progression ratios (PPR) for the wealth index categories in both groups revealed a noticeable decrease when moving towards the higher wealth index; it was found that the childbearing probability had decreased from .57 and .62 for the very poor women to .49 and .55 for the very rich women, for the first and second group, respectively.

Regarding the probabilities for the husbands' and the wives' levels of education, it appears that there is a decrease in the probability of a woman having her first birth during the first three years of the marriage when moving to a higher education group for the women in the first group. On the other hand, for the second group of women, it was found that this probability is higher among the uneducated women and those with primary education than among those with secondary or higher education. The probability is also higher among those married to uneducated men, as compared to those married to educated men.

Table 1. Parity progression ratios (PPR)* and median of the interval from the marriage to first birth, thirty-six months (three years) after marriage (the first group, the second group)

Women characteristics	**1st group**		**2nd group**	
	PPR	**Median in months**	**PPR**	**Median in months**
Total sample	.5237	18.98	.5915	21.07
Type of place of residence:				
Urban	.5048	18.78	.5663	20.61
Rural	.5381	19.14	.6124	21.47
Wealth index:				
Poorest	.5666	19.33	.6158	22.26
Poorer	.5544	19.37	.6140	22.00
Middle	.5255	18.92	.6079	20.58
Richer	.5124	18.77	.5763	20.65
Richest	.4874	18.77	.5508	20.03
Woman highest educational level:				
No Education	.6150	19.67	.6126	23.11
Primary	.5841	19.11	.6173	21.17
Secondary	.5156	18.94	.5737	20.15
Higher	.4776	18.69	.5714	19.48
Husband highest educational level:				
No Education	.5962	19.50	.6120	23.13
Primary	.5598	19.06	.5912	21.61
Secondary	.5161	18.96	.5869	20.48
Higher	.4918	18.77	.5748	19.66
Woman's currently working:				
No	.5271	18.99	.5949	21.24
Yes	.4991	18.93	.5772	20.39
Woman use of contraceptives:				
No	.5999	21.20	.5376	27.09
Yes	.5096	18.62	.5974	20.57
Woman's age at first cohabitation:				
≤ 19	.5648	19.30	.6140	22.29
20 – 24	.4919	18.70	.5647	19.76
25 – 29	.4982	18.88	.5396	19.39
30 +	.5634	19.51	.6667	19.82

* (Yadava & Sharma, 2009)

The figures for the previous use of any method of family planning indicate the most prominent differences in the values of the childbearing probabilities. Concerning the first group of women, the probability of a woman having her first birth during the first three years of the marriage increased more among the women who had never previously used the methods of family planning than among those who had used them. On the other hand, the results showed the opposite for the second group of women.

The ratios for the women of the two groups under study, show a decrease in the probability of a woman having her first birth during the first three years of the marriage more among the women in their twenties than among those who got married at less or more ages.

As for the time taken by 50% of the women to conceive their first births within the first three years of the marriage, the results show that that interval reached 21 months among the women of the second group, while it reached 19 months among the women of the first group.

By looking at the values for that period in the categories of the variables under study for the women of the first group, it was found that all of these values are close to 19 months. However, that was with the exception of the categories of the uneducated women, those who were married to uneducated men, and those who got married in the age of 30 years or more. In these categories, it was found that these values for the same period were one month more than the first categories, as they reached 20 months. Moreover, the values were two months more in the category of the women who had never used a method of family planning, as they reached 21 months.

As for the time period for the women of the second group, which reaches 21 months, it is noted that the values of that period are not stable among the categories of the variables under study, with a difference of more or less than one or two months in the categories of most variables. However, that was with the exception of the category of the women who had not previously used a method of family planning, as the values increased more than those of the previous category by 6 months to reach 27 months.

Proportional Hazard Model

To determine the factors which have a significant effect on the first birth conception interval, the proportional hazard model was used (Cox, 1972), (Hailu, 2015). Table 2 compares the results of the two groups under study that were obtained from Cox's proportional hazard regression analysis. Cox's analysis showed no difference between the two groups in terms of the variables with a significant effect on the first birth conception interval. In

both groups, all the variables introduced in the analysis showed a very strong effect, at the 1% significance level, for the education of the woman, her age at her first cohabitation, and the previous use of any method on the first birth conception interval. On the other hand, the rest of the variables did not show a significant effect on that interval.

The regression coefficients (β's) show the relationship with the survival time. The positive sign in (β's) means a negative relationship with the survival time, a high maternity risk, and a less survival time. On the other hand, the negative sign in (β's) means a positive relationship with the survival time, a low maternity risk, and a longer survival time (Shoieb, 1998).

The women, who obtained a primary, secondary, or higher education, were at a greater risk of becoming mothers, as compared to uneducated women. As for those who used contraceptives, they had a very high risk of having their first births more than those who did not use them. Concerning the woman's age at the time of her cohabitation, for both groups under study, the results indicate that the risk of having the first birth was higher with the increase of the woman's age at the time of her marriage.

Discussion

The results of the study showed that the period taken by 50% of the women to conceive their first births has decreased more among those who got married in the ten years preceding the survey than among those who have been married for more than ten years. This indicates a decrease in the interval between the marriage and the first birth in the period when the fertility rates rose (2004-2014), as compared to the period prior to it, when the fertility rate was taking a declining trend. This may indicate the relationship between fertility rates and the interval between marriage and the first birth.

The periods under study did not differ in terms of the variables with a significant effect on the interval between the marriage and the first birth. These variables are the woman's education level, her age at her first cohabitation, and the previous use of family planning methods.

The educated woman is more informed about reproductive health in general. The higher the educational level of any or both spouses, the greater the degree of awareness and management of all matters related to the reproductive process.

Table 2. Regression Coefficients (B's) and Z Scores (Wald statistic) for the first birth interval in (the first group, the second group)

Women characteristics	1st group					2nd group				
	Regression Coefficients (B's)	Standard Error	W	P-values	Exp(B)	Regression Coefficients (B's)	Standard Error	W	P-values	Exp(B)
Type of place of residence										
Rural (RC)										
Urban	.023	.023	1.018	.313	1.024	-.021	.021	1.016	.314	.979
Woman highest educational level										
No Education (RC)			18.443	.000				37.938	.000	
Primary	.085	.054	2.499	.114	1.088	.132	.033	15.787	.000	1.142
Secondary	.143	.037	15.111	.000	1.153	.165	.028	35.262	.000	1.180
Higher	.190	.048	15.434	.000	1.209	.130	.050	6.781	.009	1.139
Husband highest educational level										
No Education (RC)			2.881	.410				5.577	.134	
Primary	-.003	.048	.004	.952	.997	.025	.033	.581	.446	1.025
Secondary	.047	.040	1.388	.239	1.048	.065	.029	4.965	.026	1.167
Higher	.051	.049	1.100	.294	1.053	.075	.043	2.938	.086	1.077
Woman's currently working										
No (RC)										
Yes	-.024	.034	.480	.489	.977	-.032	.027	1.491	.222	.968
Woman's age at first cohabitation	.015	.003	26.579	.000	1.015	.056	.003	440.507	.000	1.057
Woman use of contraceptives										
No (RC)										
Yes	.506	.030	275.105	.000	1.658	.660	.034	376.365	.000	1.936
RC = Reference category	**Chi – square = 368.851**			**P-value = .000**		**Chi – square = 1005.403**			**P-value = .000**	

The woman's or the husband's ignorance and their limited levels of education lead to poor awareness and information; thus, this results in the inability to control the timing of pregnancy.

This accounts for the high risk of women becoming mothers among the categories of the more educated women as compared to the uneducated women. This was also reflected in the values of the period taken by 50% of the women to conceive the first child. This is also apparent in all educated groups as they get the lowest median as compared to the uneducated group for the two groups under study. This result is in agreement with the findings of (Alam, 2015), (Rahman et al., 2013), (Saadati et al., 2018).

The period during which a woman can conceive a child is limited as it often ends when the woman reaches the age of 49. The chance of becoming pregnant during that period decreases as the woman approaches this age. That is the reason why the woman, who gets married for the first time at an older age, realizes that the remaining period for her to be able to become pregnant is limited. Therefore, she tends to be more eager to get pregnant as soon as she gets married, especially if she wishes to conceive more than one child while leaving an adequate interval of time in between them that enables her to maintain her health as well as the fetus's and to give them their due care and attention. This may explain the slight increase risk of maternity among the women who are older at the time of their first marriages. This was consistent with the results of many researchers (Alam, 2015), (MacQuarrie, 2016), (Mubiru et al., 2016), (Rahman et al., 2013), (Shoieb, 1998).

The woman, who obtains her first birth after a short period since the beginning of the marriage, often resorts to using a family planning method until she decides to stop using it to conceive her second child. That is why using a family planning method is the cause of the high risk of childbearing among the women who have previously used it as compared to those who have not previously used any method. These findings were consistent with the results of the studies by (Alam, 2015), (Rahman et al., 2013). In other words, the women, who use family planning methods, are the ones who got their first births after a short interval since the beginning of the marriage. This is confirmed by the obvious decrease in the values of the time taken by 50% of the women to conceive their first births more among the users of the methods than among the non-users for the two groups under study, especially for the period (11+ years).

Conclusion and recommendations

- The study showed a decrease in the interval between the marriage and the

first birth in the time periods that were characterized by a rise in fertility rates than in the periods characterized by the opposite, which requires more studies inside Egypt. Therefore, with the changes that the world is witnessing today from the successive spread of epidemics and health crises, which require citizens to adhere to their homes most of the time, the Ministry of Health and Population, in cooperation with the Ministry of Information, must develop proactive awareness plans that can be used if necessary, aiming to reduce exposure Couples to have unplanned children, which is one of the reasons for raising fertility rates.

- The interval between the beginning of the marriage and conceiving the first birth is less among the categories of the educated women. The indirect methods in this case are often useful in achieving goals. Accordingly, since the divorce rates in the Egyptian society have become high recently, the study aims to focus on the important role that the different mass media play in raising awareness of the Egyptian women. This is because it is easier to raise awareness of the women with higher levels of education. Awareness needs to be raised concerning extending the interval between the beginning of the marriage and conceiving the first birth until both spouses are assured of the possibility of continuing their marriage together before deciding to have a child. This in turn will benefit the mother and the child. In addition to that, it reduces the effective age of a woman's ability to bear more children.

The media should increase its activities for raising awareness about the period which pregnancy can occur within, how a woman can determine that period, and the locations of the agencies that provide free family planning methods so that the woman can control the occurrence of pregnancy if she is convinced to exclude the idea as soon as she gets married.

- Providing a hotline through which women can put forward the reasons for their inability to control their reproduction to receive counseling, moral, and material assistance, represented in the provision of family planning methods and places to receive free reproductive health care. With the promotion of this hotline through all media and social media.

- Most of the many services provided by the Ministry of Health and Population in the field of family planning and reproductive health are not known to most Egyptian women. Therefore, these services must be promoted in various ways in which the information can be delivered to the target audience.

- On the other hand, assistance should be directed to cases of early infertility, with continued follow-up in cases of childbearing, to ensure life within the framework of family planning and reproductive health.

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احتمالات الإنجاب خلال السنوات الأولى من الزواج بين النساء المصريات - أساليب تحليلات البقاء

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الملخص

إطالة الفترة بين الزواج والولادة الأولى يقلل من العمر الفعلي للإنجاب لدى المرأة وبالتالي يقل عدد الأطفال خلال حياتها. هدفت هذه الورقة إلى دراسة الفترة ما بين الزواج والولادة الأولى من حيث طول هذه الفترة واحتمالات حدوث الإنجاب بها والمحددات ذات التأثير المعنوي لدى مجموعتين من السيدات، الأولى: السيدات اللاتي تزوجن في الفترة التي اتسمت بارتفاع معدل الخصوبة الكلي. والثانية تشمل السيدات اللاتي تزوجن في فترات اتسمت بانخفاض مقبول في معدلات الخصوبة. تم استخدام جدول الحياة ونموذج كوكس والمسح الديموغرافي الصحي المصري لعام ٢٠١٤. أظهرت النتائج انخفاض تلك الفترة في المجموعة الأولى مقارنة بالمجموعة الثانية. بدت الفروق بين المجموعتين طفيفة من حيث احتمالات الإنجاب. لم يظهر اختلاف بين الفترتين من حيث المتغيرات ذات التأثير المعنوي على تلك الفترة. وفقًا لتحليل كوكس، فإن المستوى التعليمي للمرأة، والعمر عند الزواج الأول، والاستخدام السابق لوسائل تنظيم الأسرة هي فقط المتغيرات المعنوية. من الضروري نشر الوعي بضرورة اطمئنان الزوجين لاستمرار الزواج قبل اتخاذ قرار إنجاب طفل. يهدف هذا إلى الحد من العمر الفعلي لقدرة المرأة على إنجاب المزيد من الأطفال.

الكلمات المفتاحية: احتمالات الانجاب، الفترة حتى إنجاب الطفل الأول، السيدات المصريات، جدول الحياة، نموذج تحليل كوكس.