Women Health, Child Survival and Birth Spacing in Egypt: A challenge for achieving the sustainable development goals

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Abstract

Introduction: Interpregnancy intervals (IPI) in Egypt have been shown to short and this may contribute to adverse outcomes among women and children. The population problem remains a barrier to achieving the sustainable development goals (SDGs).

Aim: To study the relationship between birth spacing, anemia and obesity among married women and stunting and mortality among children under-five years of age.

Methods: Data was retrieved from the Egypt demographic health survey (EDHS) of 2014 for 25 governorates in Egypt including: 4 Urban (4), 12 in Lower Egypt (LE), 8 in Upper Egypt (UE) and 3 Frontier governorates. The data included IPI, nutritional status of children under five of age for height for age (H/A) to assess stunting, mortality rates for children including neonatal mortality rate (NMR), infant mortality rate (IMR) and under five mortality rate (U5MR). Maternal health was assessed by anemia during pregnancy and obesity among ever married women (15-49 years of age) and cesarean section (C-S). The data was analyzed by SPSS (20) using the Pearson correlation coefficient.

Results: Overall IPI were shorted in UE and longer in urban governorates. IPI 7-17 months was significantly correlated with NMR (r0.5, P=0.025) and stunting (r0.4, P=0.4). While birth interval 60+ months was inversely correlated with NMR (r-0.6, P=0.004), IMR (r-0.4, P=0.05), and stunting (r-0.5, P=0.009). IPI of 60+ months showed significant inverse correlations with anemia (r-0.5, P=0.008), C-S (r-0.5, P=0.02), and obesity or overweight among women 15-49 years (r-0.4, P=0.03).

Conclusions: Longer IPI for 60+ months are protective against obesity among women and stunting and early deaths among children. Birth spacing is a key strategy for health of the vulnerable populations for achieving the SDGs. It should be encouraged among women through education and awareness campaigns on its effect of child survival, prevention of stunting and obesity in women. Moreover it could be a strategy for reducing the indications for C-S delivery.

Key words: Birth spacing, neonatal mortality, infant mortality, stunting, maternal anemia, obesity, cesarean section
Disclosures: None

Introduction

Egypt faces the challenge for achieving the sustainable development goals SDGs for women and child health, empowerment and adequate nutrition. Birth spacing is a recommended tool to reduce adverse health outcomes especially among women. In Egypt short birth intervals were shown to have negative effects on maternal health [(1)]. However its effect on child growth and survival are few and controversial. It is important to study the underlying factors that influence such relationships in order to formulate effective policies for reducing infant mortality and improve family planning [(2)]. The latter workers found that prolonging birth intervals would reduce infant mortality. Other workers have shown that short interpregnancy

intervals (IPI) (<24 months) was associated with preterm delivery; low birth weight and perinatal death [3]. However, another study in Canada also suggests that both short and long interpregnancy intervals are associated with adverse perinatal and neonatal outcomes [4]. Breastfeeding is compromised by reduced IPI, increasing risk of child mortality and malnutrition [5].

The effect of family planning on the levels of women's anaemia and child undernutrition is controversial. A study in India found that the contraceptive prevalence rate was negatively associated with women's anaemia, child underweight, and child stunting even after controlling for child marriage, female literacy, per capita GDP, poverty ratio, health expenditure and food security [6].

In Egypt with the increasing population growth and economic constraints, the effect of IPI becomes increasingly important to assess in relation to its effect on maternal and child health. The effect on child health will have a cumulative economic cost on health care expenditure and on the economy of a country.

Hence the aim of this study is to examine the effect of shorter vs. longer IPI on the outcome on child nutritional status and survival.

Methods

Data was retrieved from the Egypt demographic health survey of 2014 [7]. Data for 25 governorates in Egypt including 4 Urban (4), 12 in Lower Egypt (LE), 8 in Upper Egypt (UE) and 3 Frontier governorates. Data was collected for birth intervals (IPI) for each governorate and analyzed by region. Also data for neonatal mortality rate (NMR), infant mortality rate (IMR) and under five mortality rate (U5MR) for each governorate and by region. Anemia for pregnant women and stunting among children were used to assess nutritional status in women and children. Statistical analysis was done using the SSPS (version 20). Tools used included descriptive analysis for mean and standard deviation and Pearson correlative studies. Cut off for probability of significant difference between groups (null hypothesis) $P<0.05$ and $P<0.01$.

Results

Table (1) compares the mean prevalence birth intervals by period across the regions in Egypt. In Urban governorates. The interval 7-17 months was lowest in Mid Delta (6.8±2.3 mo) and highest in Urban governorates (8.15±0.7 mo). The mean prevalence for the interval of 18-23 months ranged from 9.9±3.9 in Southern UE to 9.1±3.35 in the mid delta. The mean prevalence for the interval of 24 to 35 ranged from 27.3±2.2 in urban gov. to 24.3±2.2 in Frontier gov. The mean prevalence for the interval of 36 to 47 ranged from 19.2±3.1 in urban gov. to 17.1±5.4 in Southern UE. The mean prevalence for the interval of 48 to 59 ranged from 11.35±1.57 in urban gov. to 9.9±3.4 in Northern UE. The mean prevalence for the interval of 60+ mos ranged from 24.1±3.35 in urban gov. to 18.9±6.6 in Southern UE

Table (2) demonstrates correlative studies between birth intervals 7 to 17 months versus for over 60 months with NMR, IMR and stunting in the 25 governorates under study in Egypt. Birth interval 7-17 months was significantly correlated with NMR (r0.5, P=0.025) and stunting (r0.4, P=0.4). While birth interval 60+ months was inversely correlated with NMR (r-0.6, P=0.004), IMR (r-0.4, P=0.05), and stunting (r-0.5, P=0.009). Table (3) demonstrates correlative studies between birth intervals at 7 to 17 months versus for over 60 months in relation to anemia in pregnant, cesarean delivery and ever married obese (15-49 years) in the 25 governorates under study in Egypt. Birth interval 7-17 months was poorly correlated with anemia (r0.3, P=0.1) and inversely with cesarean section (r-0.3, P=0.1) and obesity (r-0.3, P=0.1). While birth interval 60+ months showed significant inverse

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Figure (2) Prevalence of stunting in children under-five years of age was highest in Beni Suef (42%), Sharkia (36%), Giza (33%) and Souhag (32%). It was lowest in New Valley (6%), Menoufia (9%), Ismailia (10%) and Dakhlia (10%). Sixteen out of the 25 governorates had values of between 30% to 10%. Geographically the governorates near the Mediterranean are better off, while those in the mid-delta and Upper Egypt are worse off.

Figure (3) shows the percent prevalence of anemia in ever married women 15-49 years in the 26 governorates of Egypt. The prevalence was highest in Menya (53%) followed by BeniSuef (45%), Dakhlia (37%) and Souhag (34%). It was lowest in Alexandria (8%), Port Saed (10%), New Valley (12%) and Kafr ElSheikh (13%). Overall prevalence was highest in governorates of UE than in LE and in particular in the Northern governorates of LE. About one half of the governorates had a prevalence of between 30% to 20%, which indicates that 1 in 3 to 1 in 4 of Egyptian women suffer from anemia.

Figure (4) shows the relationship between birth intervals and anemia prevalence in women by governorate (EDHS, 2014). There is a tendency to an inverse relationship between birth spacing and anemia in women aged 15 to 49 years. The higher the tendency of the governorate to have shorter intervals and less spacing the higher the risk of the anemia, this is particularly seen in Souhag, Aswan, BeniSuef, Fayoum, Menya, Suez, Red Sea, Sharkia and Giza. In governorates like Kafr ElSheikh, Dakhlia, Alexandria and Qena the increase in the spacing was associated with a decline in the anemia. However most of the short spacing and high prevalence of anemia was seen in the UE governorates.

Figure (5) shows the relationship between anemia in women aged 15 to 49 years and stunting in children under-five years of age. The relationship is not consistent in all governorates and although there is some tendency in some governorates to show lower stunting in less anaemia other did not show this relationship, indicating that factors other than anemia interplay in influencing stunting in these children.

Table (1) Comparison of the mean prevalence of birth intervals by period across the regions in Egypt

IPI in months	7 -17 mo	18-23 mo	24-35 mo	36-47 mo	48-59 mo	60+ mo
Urban gov.	8.15	9.8	27.33	19.2	11.35	24.1
	±0.71	±1.67	±2.2	±3.1	±1.57	±3.35
Frontier gov.	7.28	9.25	24.33	17.86	10.7	20.8
	±2.56	±3.23	±8.02	±5.7	±3.5	±6.9
Northern Delta gov. (LE)	7.1	9.1	24.39	17.52	10.26	20.50
	±2.36	±3.35	±7.87	±5.73	±3.34	±6.57
Mid-delta gov. (LE)	6.8	9.2	24.9	17.5	10.2	19.9
	±2.28	±3.11	±7.89	±5.49	±3.23	±6.29
Northern UE	7.1	9.4	24.9	17.4	9.9	19.3
	±2.6	±3.3	±8.01	±5.5	±3.4	±6.3
Southern UE	7.5	9.9	24.53	17.1	10.1	18.9
	±3.3	±3.9	±7.8	±5.4	±3.4	±6.6

Source: EDHS, 2014, IPI: interpregancy interval, mo: months, LE: lower Egypt, UE: Upper Egypt.

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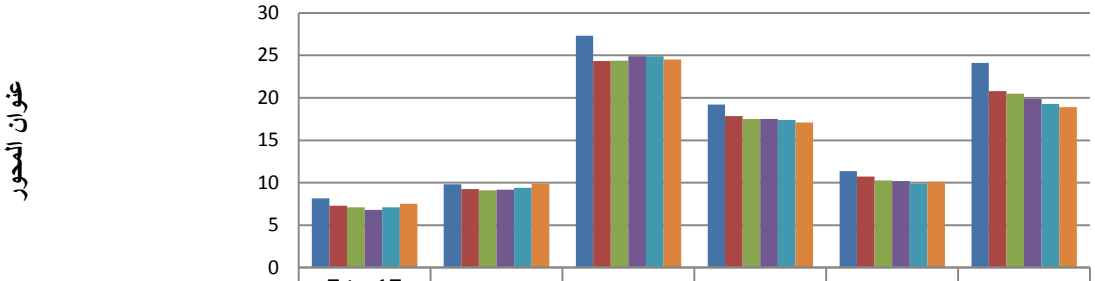
Source: EDHS, 2014, IPI: interpregancy interval, mo: months, LE: lower Egypt, UE: Upper Egypt.

Figure (1) Distribution of birth intervals by region and governorate



	7 to 17 months	18-23mo	24-35mo	36-47mo	48-59mo	60+mo
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Northern Delta Gov.(4)	7.1	9.1	24.39	17.52	10.26	20.5
Mid Delta gov.(5)	6.8	9.16	24.9	17.5	10.2	19.9
Northern UE gov.(4)	7.1	9.4	24.9	17.4	9.9	19.3
Southern UE gov.(5)	7.5	9.9	24.53	17.1	10.1	18.9

Table (2) Relationship between birth intervals 7 to 17 months versus for over 60 months with NMR, IMR and stunting in the 25 governorates under study in Egypt

Variable	NMR (25)	Sig. (2-tailed)	IMR (25)	Sig. (2-tailed)	Stunting	Sig. (2-tailed)
Birth Intervals 7 to 17 months	r0.5*	0.025	r0.3	0.15	r0.4*	0.04
Birth intervals > 60 months	r-0.6**	0.004	r-0.401*	0.05	r-0.5**	0.009

Pearson Correlation (r) significant a P<0.05 * Correlation significant at P<0.01**
Source of data: (EDHS, 2014)

Table (3) Relationship between birth intervals at 7 to 17 months versus for over 60 months in relation to anemia in pregnant, cesarean delivery and ever married obese (15-49 years) in the 25 governorates under study in Egypt

Birth interval	Anemia in pregnant (25)	Sig. (2-tailed)	Cesarean delivery	Sig. (2-tailed)	obese or overweight women	Sig. (2-tailed)
Birth Intervals 7 to 17 months	r0.34	0.1	r-0.34	0.09	r-0.3	0.16
Birth intervals > 60 months	r-0.52**	0.008	r-0.5**	0.02	0.43*	0.03

Pearson Correlation (r) significant a P<0.05 * Correlation significant at P<0.01**
Source of data: (EDHS, 2014)

Figure (3) Percent prevalence of anemia in ever married women 15-49 years in the 26 governorates of Egypt.

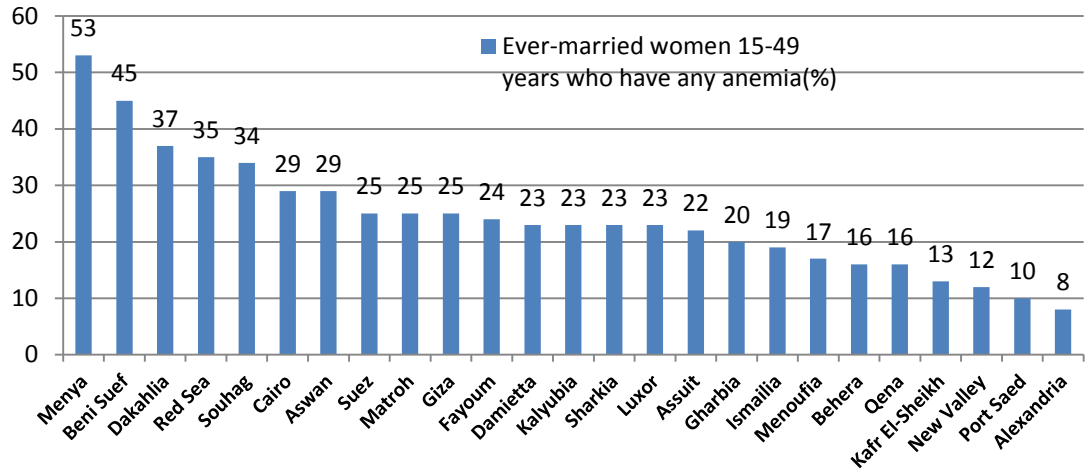
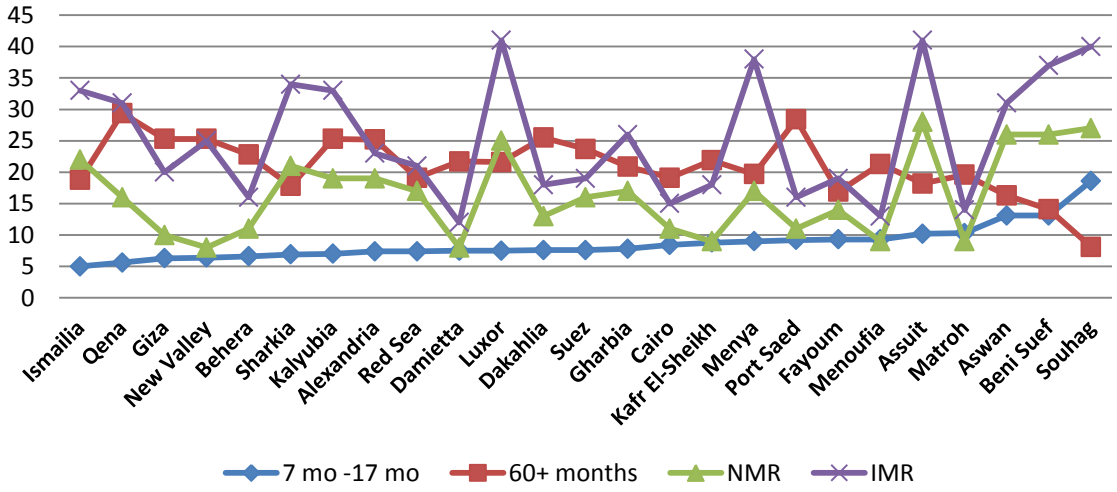


Figure (2) Relationship between birth intervals and neonatal and infant mortality rates



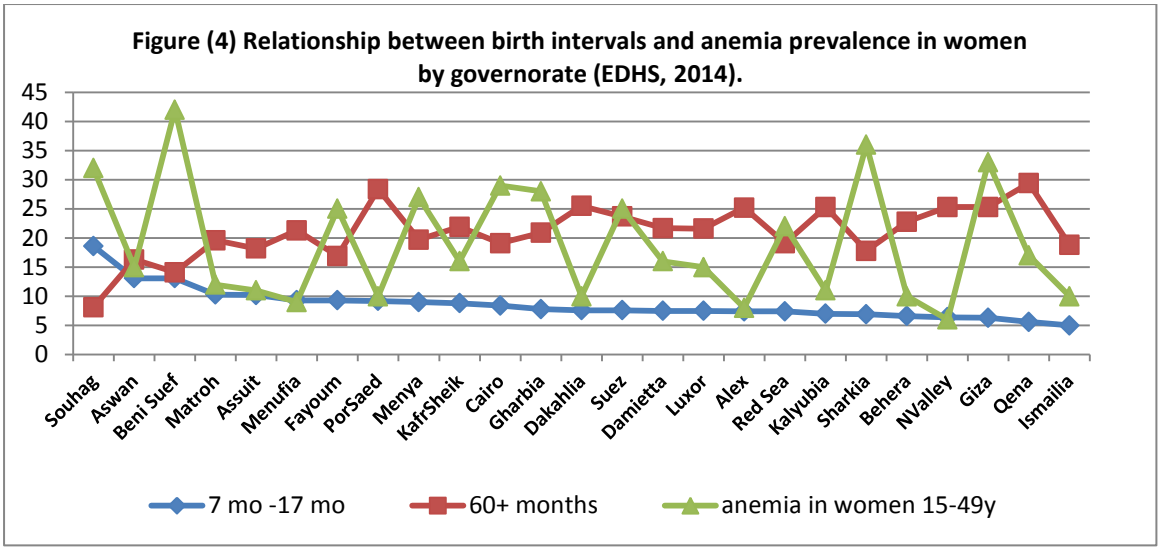


Figure (4) Relationship between birth intervals and anemia prevalence in women by governorate (EDHS, 2014).

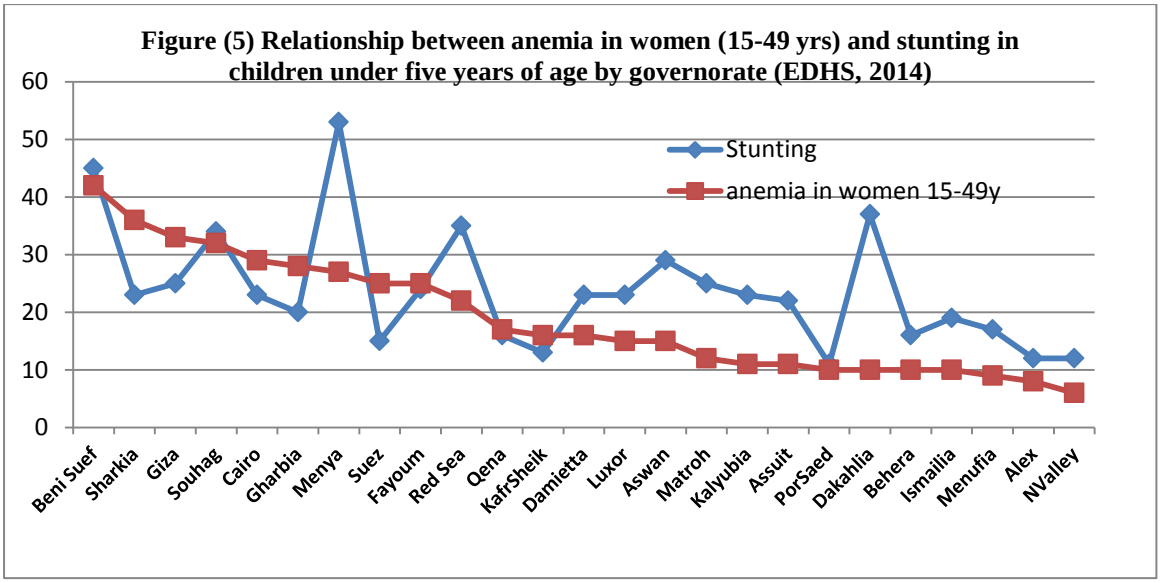


Figure (5) Relationship between anemia in women (15-49 yrs) and stunting in children under five years of age by governorate (EDHS, 2014)

Table (2) Correlative studies between birth spacing with anemia in women and stunting in children under five of age in the Egyptian governorates

Birth spacing	7-17 mo.	18-23 mo.	24-35 mo.	36-47 mo.	48-59 mo.	60+ mo.
Stunting	r0.36	r0.22	r0.25	r0.08	r-0.13	r-0.53
Anemia	r0.4	r0.33	r0.41	r-0.025	r-0.52	r-0.51

Discussion

This study also showed that stunting was reversed by longer IPI of over 60 months. In a cohort of more than 171 000 births and relative to IPI of 18 to 23 months, IPIs shorter than 12 and longer than 23 months were associated with significantly increased odds of preterm birth overall and both medically indicated and spontaneous preterm births, low birth weight, and small for gestational age [(8)]. This could be related to the ability of women to regain their nutrition stores with longer IPI which have direct effects on small and appropriate weights for gestational age. Breastfeeding reduced the odds of being stunted. Iron-rich food

consumption was inversely associated with moderate anemia. Male sex and maternal anemia were also significant predictors of moderate anemia in the child [(8)]. These data also bring show the importance of exclusive breastfeeding to enhance proper nutritional approach and to prolong lactational amenorrhea. Health care system stakeholders would find this study useful as a guide for policy formulation and implementation.

This study showed strong and evident protective effect of longer IPI on NMR, IMR and U5MR. A study was conducted to determine the prevalence of adverse child health outcomes in sub-Saharan Africa countries with the length of preceding birth interval. They found that children who were conceived after a birth interval <24 months had 57% higher risk of infant mortality, compared to children with IPI of 24-36 months (Hazard ratio (HR) = 1.57; 95%CI: 1.45, 1.69). However, there were 19% and 10% reduction in the risk of infant mortality at IPIs of 37-59 months and ≥60 months, compared to 24-36 months IPI [(10)]. Another study showed that shorter IPI (i.e., <6 months, 6-11 months, and 12-17 months) compared to 'ideal' IPI (i.e., 18-23 months), were associated with infant mortality even after adjusting for confounders. Short intervals were significantly associated with neonatal, but not post-neonatal deaths. IPI above 23 months were not associated with infant mortality [(11)]). However a more recent study showed that birth spacing greater than 18 months was negatively associated with under-five mortality. The most common causes of death among children under five were malaria (19%), respiratory infection (13%), and anemia (11%) [(12)].

Another study showed that increasing infant and senescent mortality in different populations decreases IPI. They showed that sibling competition and infant mortality interact to lengthen interbirth intervals. In lower-mortality populations, intense sibling competition pushes births further apart. The effect is only evident when infant mortality is low [(13)].

A positive linear relationship was observed between IPI and data of hemoglobin level of women from DHS of 20 African countries for a total of 49,260 children aged 6-59 months. The effect of a month increase in birth interval is associated with an average increase of 0.025 g/l in hemoglobin level (P = 0.001) in girls, while for boys the effect was not significant. In addition, for girls, the effect of length of preceding birth interval was highest in young mothers and mothers with higher hemoglobin levels, while for boys, the highest effect was noticed for those living in more highly educated regions [(14)].

Systematic reviews for articles published from the first of January, 2006 and first of May 2017 on evidence of adverse maternal outcomes on short IPI, showed that it is associated with increased risks of subsequent pre-pregnancy obesity, gestational diabetes, and decreased risk of preeclampsia [(15, 16)].

The study also showed that longer IPI was inversely correlated with delivery by C-S. This is expected as longer birth intervals would reduce the complications and consequently reduce the indications and need for C-S [(16)].

Conclusions: This study confirms that IPI does have an effect on child survival and nutritional status of children, whereby longer IPI over 60 months was protective against neonatal deaths, infant and under-five mortality and stunting. On the other hand, shorter birth intervals were associated with neonatal mortality [(3)].

Hence it is recommended that such findings be disseminated to the public so that women and families learn that their child could be exposed to adverse outcomes with shorter IPI. Moreover studies on the IQ of children in relation to IPI should be conducted in order to assess the effect of shortened IPI on child's IQ. It is expected that child's IQ will be affected by shorter IPI as these women will stop breastfeeding early which consequently will affect the potential of their child to achieve a higher IQ as intended by their genetic make-up. Moreover, the unborn child in uteru could be exposed to deficiency of important nutrients necessary for optimum growth and development and thus impeding normal brain development. It is thereby recommended that women learn about these facts and also be informed of the negative effect of close IPI on their physical appearance and predispose them to obesity. Breastfeeding continuation for two years supports women to lose weight, space births and protect their child. However policies to support females to continue their education and to support working women to breastfeed at work are inadequate. Enacting laws for high quality child care services in or near her work that support breastfeeding and feeding breastmilk should be integrated in the quality standards of nurseries. Working mothers should be able to express their breastmilk at work to feed the baby and continue breastfeeding for two years. These are essential strategies for supporting the achievement of the SDGs for women and child health, survival and empowerment. Such information when integrated in the school curricula, the media, soap operas and other TV programs and social media can be influential in changing women attitudes towards birth control to bring a stop to aggressive rise in population growth.

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دراسة تأثير المباعدة بين الولادات على البدانة و الأنيميا بين السيدات وبقيا و تقزم الأطفال في مصر: المباعدة من أجل التنمية المستدامة

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نبذة مختصرة عن البحث

مقدمة: لقد تبين أن الفترات الفاصلة بين فترات الحمل في مصر قصيرة وهذا قد ينتج عنه عواقب سلبية على صحة النساء والأطفال و تعيق قدرة مصر على تحقيق أهداف التنمية المستدامة.

الهدف: دراسة العلاقة بين المباعدة بين الولادات والبدانة وفقر الدم بين السيدات و التقزم و الوفيات عند الأطفال.

طرق البحث: تم استرجاع البيانات من مسح الصحة الديموغرافي في مصر لعام 2014 لـ 25 محافظة في مصر بما في ذلك: 4 مدن و 12 محافظة في وجه بحري و 8 في صعيد مصر و 3 محافظات حدودية. شملت المعطيات المباعدة بين فترات الحمل (7-17و 18و 23- 24-36 و 36-59 و 60+) ، الوضع التغذوي للأطفال دون سن الخامسة للتقزم ، ومعدلات وفيات الأطفال بما في ذلك معدل وفيات حديثي الولادة ، ومعدل وفيات الرضع ومعدل وفيات الأطفال دون الخامسة. تم تقييم صحة الأم عن طريق فقر الدم أثناء الحمل والسمنة بين النساء المتزوجات (15-49 سنة من العمر) والعمليات القيصرية. تم تحليل البيانات بواسطة SPSS (20) باستخدام معامل الارتباط Pearson.

النتائج: بشكل عام في كان هناك قصور في المباعدة بين حمل و آخر في محافظات وجه قبلي بالمقارنة للمحافظات الحضرية. كما كان هناك ارتبطًا ايجابياً مؤثراً ما بين المباعدة لفترة من 17-7 شهرًا مع معدل وفيات الولدان (r0.5، P = 0.025) والتقزم (r0.4، P = 0.4). في حين كان الفاصل الزمني للولادة 60+ أشهر يرتبط عكسيا مع معدل وفيات الأطفال حديثي الولادة (ص 0.6 ، P = 0.004) ، وفيات الرضع (ص 0.4 ، P = 0.05) ، والتقزم (ص 0.5 ، P = 0.009). أظهر IPI لمدة 60+ أشهر وجود علاقة عكسية مع فقر الدم (r-0.5، P = 0.008) ، الولادة القيصرية (r-0.5، P = 0.02) ، والسمنة أو زيادة الوزن بين النساء 15-49 سنة (r-0.4، P = 0.03).

الخلاصة: ينبغي تشجيع النساء على استخدام وسائل تنظيم الأسرة للمباعدة طويلة المدى 60+ شهرًا من خلال حملات التثقيف والتوعية حول تأثيره على بقاء الطفل و ذكاء الطفل ، والوقاية من التقزم في الأطفال والسمنة لدى النساء. علاوة على ذلك ، يمكن أن تكون استراتيجية لتخفيض مؤشرات الولادة القيصرية. إن المباعدة محور من المحاور الأساسية لتحقيق أهداف التنمية المستدامة و لا يتأتى ذلك إلا من خلال تشجيع مواصلة الرضاعة الطبيعية لعامين و دعم الفتاه على مواصلة التعليم والأم العاملة في استمرار الرضاعة الطبيعية من خلال القوانين التى تسمح لها بوجود أمكان في العمل للرضاعة الطبيعية و لرعاية طفلها و لتعصير لبنها وأن يساهم الزوج معها في ذلك.