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Reproductive Health of Women in Rural Areas of East Azerbaijan – Iran, before and after Implementation of rural Family Physician Program: an Ecologic Study

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ABSTRACT

Introduction: Implementation of rural family physician program in Iran in 2005 has been evaluated and shown that this program has been led to some improvements in health indicators. In this study, some reproductive health (RH) indicators were compared before and after implementation of this program in rural areas of East Azerbaijan, Iran.

Methods: In this ecologic- time trend study, the data of 191075 births of rural women of East Azerbaijan from 2001 to 2010 was extracted from vital horoscope (ZIJ) and used for calculation of 20 important RH indicators. The paired t-test and correlation analysis wear used for data analysis.

Results: Some indicators such as adolescent marriage rate, adolescent birth and over 35 year olds birth rate were increased after rural family physician program implementation in 2005. Also stillbirth rate and unsafe delivery were decreased during this period. There was a significant correlation between increasing adolescent birth rate and increasing low birth weight deliveries ($r= 0.911$, $P= 0.031$) and also between increasing over 35 year olds birth rate and increasing neonatal mortality rate in term of prematurity and congenital malformations ($r= 0.912$, $P= 0.031$) after program implementation.

Conclusion: Perinatal care and safe delivery even for pregnancies outside the typical child-bearing ages are promoting after implementation of rural family physician program in East Azerbaijan. Also decreasing unsafe delivery and stillbirth rate can be considered as achievements of running this program in this province.

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Introduction

In international conference on population and development (ICPD) held in Cairo, Egypt in 1994, reproductive health affected by the comprehensive definition of health by world health organization (WHO) in 1946 and its subsequent revisions in Alma Ata Declaration in 1978 and Ottawa Charter in 1986, was introduced a state of complete

physical, mental and social well-being dealing with reproductive system.¹

When millennium development goals (MDGs) were created in 2000, reproductive health was specifically omitted. In 2007, based on a recommendation by the WHO, the United Nations General Assembly formally approved the addition of target 5B “Achieve universal access to reproductive health” to be nested under goal 5 of MDGs²

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and new indicators such as adolescent birth rate (ABR), antenatal care coverage, unmet needs for family planning and contraceptive prevalence rate were included under this target.³

According to credible global reports, improvement of reproductive health-related outcomes such as reducing maternal and child mortality in countries such as Iran, largely owes to the application of integrated primary health care.⁴

In response to other challenges of primary health care (PHC) such as providing ineffective and low responsive services⁵ and alongside of comprehensive insurance coverage of Iranian rural population from 2005, almost 100 percent of rural population became under coverage of family physician program and referral system. Implementation of this program and its effects on health indices has been evaluated in short term and this evaluation and several ongoing monitoring programs have shown this program has been led to implicit and explicit improvements in health indices.⁶

Although many short course evaluations of rural family physician program in Iran have underlined its benefits in improvement of many reproductive health indicators such as maternal and child deaths, deliveries carried out by skilled attendance⁷⁻⁹ and family planning coverage^{7,10} but none of them has pointed the status of early marriage or pregnancies outside the typical child-bearing ages (i.e. pregnancies under 20 years or over 35 years olds) especially after running of this program.

Also none of studies mentioned above has evaluated a wide gamut of reproductive health indicators in symmetric intervals before and after implementation of the program.

Therefore, in this study, we intended to examine a wide range of the most important reproductive health indicators such as pregnancy outside the typical childbearing ages and compare them in equal intervals

before and after implementation of rural family physician program in East Azerbaijan province, Iran.

Materials and methods

This ecological, time-trend study examined changes in the reproductive health indicators. Raw data related to both age specific fertility rates and reproductive health indicators were gathered from ZIJ of the East Azerbaijan rural population recorded between the years 2001 to 2010 in the department of health informatics in regional health center of East Azerbaijan province and required indicators were calculated using spreadsheet software designed for this purpose.

It is noteworthy that vital horoscope (ZIJ) is an oldest population-based vital registry and is considered one of the most reliable sources of information on primary health care in Iran and its face validity has been confirmed previously.¹¹

Also in this trend study we used all data related to 191075 births of rural women of East Azerbaijan during decade mentioned above and no inclusion or exclusion criteria have been used.

For statistical analysis, we first examined data distribution using non-parametric Kolmogorov-Smirnov test. The normal distribution of the data using this test was documented when $P \geq 0.05$. After having verified the normal distribution of data, while data was divided in two five-year periods before and after implementation of the rural family physician program, paired t-tests were used to compare the mean of indicators. The correlations between age-specific fertility indicators, family planning coverage and obstetric services and the outcomes of each were analyzed as well and Pearson coefficient and statistically significant relationships between variables were calculated. After testing, the indicators were classified into four groups based on statistically significant level. Accordingly, if the mean of indicators change in two five-

year periods, before and after the implementation of the rural family physician program were evident at the statistically significance level of $P < 0.01$, they would have considered as the strong evidence and in the levels between 0.01 and 0.05 as the weak evidence. The levels between 0.05 and 0.1 and above 0.1 were interpreted and analyzed as minor evidence and no evidence respectively.¹² In correlation analysis, depending on the correlation direction, we considered values between -1 and +1 for the Pearson correlation coefficient and $P \leq 0.05$ was considered as statistically significant level. We used Microsoft spreadsheet 2010 for presenting results and SPSS (version 13.0. chicago, SPSS Inc.) for statistical analysis.

Results

In this study, twenty important reproductive health indicators of the 191,075 births recorded in the ZIJ of East Azerbaijan province between 2001 and 2010 were reviewed and analyzed. As the rural family physician program in the country was carried out extensively in September 2005 and established by the end of 2005, Indicators of the years 2001-2005 related to the data of 94, 379 births as the indicators before running the program and the indicators of the next five years derived from the data of 96,696 births as indicators after running the program were compared using paired t-test (Table 1).

In the correlation analysis between specific fertility indicators and adverse outcomes of reproductive health such as increased low birth weight (LBW) and increased neonatal death due to prematurity and congenital malformations, the ten years trend was examined firstly table 2 which showed a correlation between increase in LBW and increase in fertility rates among women 10-14 years old with $r=0.69$ and $P= 0.025$ but after restriction of

our trend study to after program implementation period this correlation was documented only for ABR and LBW.

Also our analysis showed a significant correlation between Increased neonatal mortality due to prematurity and congenital malformations and increased ABR ($r=0.765$, $P= 0.010$) and increased specific fertility rate among women over 35 year olds ($r=0.68$ and $P= 0.028$), this correlation was strongly evident only for age-specific fertility over the 35 years after running the program ($r=0.91$, $P= 0.031$). It is worth noting that with restriction of trend period from 10 years to 5 years although the magnitude of correlation has been improved it's statistically significance has been diminished due to reduction in the number of observations.

Correlation analysis of indicators related to family planning and obstetric facilities and their desirable effects in reducing child mortality rates (ranging from perinatal mortality to under five mortality rates) shown in tables 3 suggested that although the increase in all methods contraceptive prevalence rate (CPR) after running the program in comparison to before it was not statistically significant and its correlation with the reduction of child mortality was negligible, ten-year trend analysis indicated its correlation with the reduction of many mortality indicators. However, the correlation analysis of the mentioned indicators in the 5-year period after the implementation of the program confirmed the minor role of the increased CPR, and there was a relatively strong reverse correlation between the increased hospital delivery and reducing stillbirth rates either in the ten-year period ($r=-0.91$, $P=0.00$) or in the period after the implementation of the program ($r= - 0.91$, $P=0.03$).

Figure 1 to figure 3 shows the adolescent birth rate, adolescent marriage trends from 2001 - 2010.

Table 1. Comparison of reproductive health indicators before and after the implementation of rural family physician program, 2001-2010

| Indicators | Before program | After program | P-value |
|---|----------------|---------------|---------|
| | Mean(SD) | Mean(SD) | |
| Stillbirth | 1.17 (0.11) | 0.91 (0.05) | 0.001 |
| ASFR* (10-14yr.) | 0.42 (0.12) | 0.68 (0.26) | 0.111 |
| ASFR(15-19yr.) | 35.28 (1.40) | 44.31 (5.87) | 0.027 |
| U-5MR** (prematurity) | 1.33 (0.35) | 0.98 (0.26) | 0.004 |
| U-5MR(malformation) | 5.17 (0.64) | 3.97 (0.70) | 0.008 |
| LBW*** | 3.72 (0.49) | 4.21 (0.14) | 0.057 |
| NMR [¥] | 14.40 (2.70) | 10.00 (1.87) | 0.001 |
| IMR ^{¥¥} | 20.65 (2.82) | 15.23 (2.79) | 0.009 |
| U-5MR | 24.67 (3.09) | 18.37 (3.18) | 0.002 |
| Hospital delivery | 90.75 (3.83) | 98.37 (1.05) | 0.004 |
| Married women (10-14yr) | 1.03 (0.09) | 1.75 (0.38) | 0.010 |
| Married women (15-19yr) | 18.15 (0.26) | 22.25 (2.36) | 0.015 |
| Child deaths in the neonatal period | 57.6 (3.60) | 54.35 (2.98) | 0.117 |
| Neonatal death due to prematurity & malformations | 63.15 (5.76) | 72.27 (2.91) | 0.058 |
| Neonatal death due to LBW | 2.26 (1.30) | 1.36 (0.73) | 0.257 |
| ASFR above 35yr. | 18.86 (0.74) | 21.37 (1.12) | 0.013 |
| Age-related high risk pregnancy | 23.52 (2.72) | 23.77 (0.75) | 0.871 |
| CPR ^{¥¥¥} | 67.9 (3.79) | 72 (0.40) | 0.064 |
| MMR [€] | 20.2 (9.16) | 23.02 (10.89) | 0.608 |
| Delivery by unskilled personnel | 7.7 (2.80) | 1.42 (0.96) | 0.002 |

*ASFR: age specific fertility rate, ** U5MR: under five mortality rate, *** LBW: low birth weight, [¥]NMR: neonatal mortality rate, ^{¥¥}IMR: infant mortality rate, ^{¥¥¥}CPR: contraceptive prevalence rate, [€]MMR: maternal mortality rate

Table 2. Correlation analysis of ASFRs and their adverse outcomes in some reproductive health indicators

| Indicators | Increased LBW ^{¥¥} newborn | | | | Increased neonatal death | | | |
|--------------------------------------|-------------------------------------|-------|----------------------------|-------|--------------------------|-------|----------------------------|-------|
| | 10 years trend | | After program [€] | | 10 years trend | | After program [€] | |
| | R* | P | R* | P | R* | P | R* | P |
| Increased ASFR [¥] 10-14yr. | 0.697 | 0.025 | 0.749 | 0.145 | 0.589 | 0.073 | 0.669 | 0.217 |
| Increased ASFR 15-19yr. | 0.525 | 0.119 | 0.911 | 0.031 | 0.765 | 0.010 | 0.779 | 0.120 |
| Increased ASFR above 35yr. | 0.398 | 0.254 | 0.419 | 0.483 | 0.688 | 0.028 | 0.912 | 0.03 |

[¥]ASFR: age specific fertility rate, ^{¥¥}LBW: low birth weight, ^{*}Pearson R, [€]The rural family physician program

Table 3. Correlation analysis of family planning and obstetric facilities indicators and their desirable outcomes in some reproductive health indicators

| Indicators | Contraceptive prevalence rate | | | | Increased hospital delivery | | | |
|--|-------------------------------|-------|---------------|-------|-----------------------------|-------|----------------------------|-------|
| | 10 years trend | | After program | | 10 years trend | | After program [€] | |
| | R* | P | R* | P | R* | P | R* | P |
| Decreased stillbirth rate | -0.804 | 0.005 | -0.332 | 0.585 | -0.915 | 0.000 | -0.897 | 0.039 |
| Decreased premature child mortality | -0.781 | 0.008 | 0.038 | 0.952 | -0.844 | 0.002 | -0.779 | 0.120 |
| Decreased congenitally malformed child mortality | -0.602 | 0.066 | -0.202 | 0.745 | -0.838 | 0.002 | -0.893 | 0.041 |
| Decreased NMR [€] | -0.763 | 0.010 | 0.067 | 0.915 | -0.919 | 0.000 | -0.711 | 0.179 |
| Decreased IMR [¥] | -0.609 | 0.061 | -0.136 | 0.827 | -0.854 | 0.002 | -0.841 | 0.074 |
| Decreased U5MR ^{¥¥} | -0.674 | 0.033 | -0.167 | 0.789 | -0.889 | 0.001 | -0.858 | 0.063 |
| Decreased child deaths in the neonatal period | -0.660 | 0.038 | 0.582 | 0.303 | -0.704 | 0.023 | -0.345 | 0.570 |
| Decreased neonatal death due to LBW [€] | -0.395 | 0.258 | 0.489 | 0.403 | -0.601 | 0.066 | 0.160 | 0.797 |

[¥]U5MR: under five mortality rate, [€]LBW: low birth weight, ^{¥¥}IMR: infant mortality rate, [€]NMR: neonatal mortality rate, ^{*}Pearson R

Discussion

As the results of this study shows primary health care in this province has achieved unique successes in the field of reproductive health, especially after implementation of family physician program in rural areas in the mid-2000s, some of them were the reduction of child mortality rates namely stillbirth rate, neonatal mortality rate (NMR), infant mortality rate (IMR) and under five mortality rate (U5MR), increase of the safe delivery and decrease of unsafe delivery and increase of using contraceptive methods (all methods not only safe ones).

Our literature review about the impacts of family physician implementation on reproductive health of Iranian rural population yielded only a few similar studies. In a study on Qazvin rural population, data was extracted from rural ZIJ during seven years (2004-2010).⁷ This study concluded that family physician program improved some health indicators such as maternal mortality rate (MMR), NMR, IMR, safe delivery and contraception methods use but was accompanied with rising LBW and stillbirth rate. With the exception of the last measure, changes of others have similarities to our study findings though time intervals before and after program running were not equal in this study.

In another study that has the most similarities to our analysis, reproductive health indicators adapted from rural ZIJ of Isfahan province during 2000s i.e. four years before and six years after running of family physician program were analyzed and like to our study, decreased mortality rates of children and increased rate of safe delivery have been introduced as beneficial achievements of program implementation.⁸

Another study that was done upon rural population auspices of Mashhad University of Medical Sciences used only eight health indicators of mother and children extracted

from sources other than ZIJ and compared these measures from four years before until three years after family physician program implementation.¹³ Findings of this study could not show any significant difference between the mean values of indices before and after implementation of the program though the authors believed that the seven years trend of indicators confirmed positive impact of the program.

Finally, in addition to above investigations in which were done in sub-national level, one national study using data from Iranian rural ZIJ, analyzed changes of eleven main health indicators from 2003 to 2007 and concluded that there was an acceptable improvement in many of them such as MMR, NMR, U5MR, safe delivery and also in stillbirth rate to some extent since starting family physician program.⁹ This study notified that factors other than family physician program should be included in interpretation of these improvements.

It is noteworthy that none of studies mentioned above has analyzed a wide range of health indicators in equal intervals before and after family physician program running similar to our study. Also our study has a unique characteristic in which discriminate it from other evaluation studies described before and it is its focus on trend changes of pregnancies outside the child-bearing age and their adverse consequences as will be described below.

The results of the present study evidenced this fact that achieving some successes, such as reducing child mortality and the emerging of some problems such as higher occurrence of adolescent birth rate (ABR), as shown in Figure1, occurred symmetrically and simultaneously.

Examining the trend of rural ABR in East Azerbaijan in a ten-year period(2001 to 2010) represented a dramatic increase of the indicator from the figure of 35 to 52 births per 1000 adolescents which was higher than

the global average of 49 births per 1000 and the national average of 31 births per 1000.¹⁴

One of the reasons for the slow decrease in ABR in the world is the increase of the adolescent population.¹⁵ The subject is not true for the population in this study because of the population decline in rural adolescents of East Azerbaijan province in this study period in which doubtlessly is due to reestablishment of family planning and birth control in Iran after 1989,¹⁶ the pregnancy trend in this age group has had relative stability which exacerbated ABR. This means that the proportion of birth to total number of adolescent women (i.e. ABR) has been increased obviously because of decreasing magnitude of the denominator (Figure 2).

According to figure 3 which shows the trends of ten-year marriage and pregnancy of rural adolescents we achieved this fact that adolescent birth rates have been increasing more rapidly than the marriage of adolescents after implementation of the rural family physician program, especially since 2007.

Statistics show that 30 percent of girls in low-to middle-income countries are married before 18^{17,18} mostly are from poor and rural families with low education.¹⁸ In the present study ,the percentage of the married under 20 year olds was close to the aforementioned figure. It is expected between the years 2021 to 2030, maintaining the current trend of child marriages, more than 150 million children worldwide will suffer early marriage each year. Thus, putting an end to the marriage in childhood and adolescence should be considered as a priority for the development of human society after 2015 in which the assessment of MDGs will be finalized.¹⁸

Investigations of the achievement rates of the MDGs have shown that the role of child marriage should be considered as an obstacle to achieve an acceptable level for many goals such as eradication of poverty and hunger, promotion of primary

education and gender equality and reducing child and maternal mortality.¹⁹

Although prevention of girls marriage before age 18 has been expressed in the first part of guideline of reducing adolescent pregnancy and its complications- prepared by the WHO,²⁰ it seems that the implementation of this item of the guideline is not possible without changing cultural and traditional attitudes of the communities. By the way, it requires the serious participation of family, school, health care institutions for privation of adolescent pregnancy under 20 years olds.^{17,18}

In the present study, what was considered as the main reason for the increase in adolescent pregnancy after intensification of maternal care system, in addition to running rural family physicians program since 2005 was merely implementation of the item 2 in the aforementioned guideline in which the increase of prenatal care and safe delivery have been focused,²⁰ and of course the first item of the guidelines is not easily applicable because of legal and cultural barriers in Iranian community.

One of the main causes of LBW is adolescent pregnancy which its correlation has been fully confirmed in the present study. In addition to the short-term effects of LBW such as increased neonatal mortality rate and the child's developmental growth disorders, it causes long-term complications such as cardiovascular diseases and diabetes mellitus in the older ages.²¹ Some justify the correlation between adolescent pregnancy and LBW with lower weight gaining of adolescent mothers during pregnancy²² which was not confirmed by some other studies and they considered this correlation very important and significant even after adjusting the confounding factors such as maternal weight gain rate during pregnancy, socio - economic factors and the level of prenatal care.²³

Unlike many studies that suggested an association between advanced maternal age and increased LBW,²⁴⁻²⁶ the correlation between these two indicators has not been proved in this study. However, examining of the association between maternal age and increased congenitally malformed and premature births in this study was impossible, because numbers of the congenitally malformed and premature births were not recorded in the ZIJ; so, we inevitably focused on and analyzed the mortality of premature and congenitally malformed neonates. In this respect, it seems that there is a strong and direct correlation between the increasing of pregnancy rates over 35 year olds and increased mortality in premature and congenitally malformed infants. Perhaps, the age of mother determines the severity of the malformation and prematurity of infants born. Of course with calculation of other indicator that refers to specific mortality rate for children (up to age 5 year) caused by malformation and prematurity and noticing its decreasing trend, we may conclude that If malformations and prematurity put children's lives at risk, it is limited to more severe kinds in neonatal period.

Providing maternal health affects many demographic rates and reproductive health outcomes such as birth rates, fertility rates (general and total) and rates of miscarriages and stillbirths, particularly LBW²⁷ in which the last one is one of the reproductive health problems in our studied rural population.

One of the reproductive health achievements of our studied rural population is decreasing stillbirth that has a strong reverse correlation with increasing safe delivery at the hospital. Stillbirth rates reduction less than one percent (or 9 per thousand births) in the rural population compared to World Statistics with an average of 1.9 percent (19 cases per thousand births)²⁷ is regarded as one of the public health successes.

Finally, the main strength of our study is that we used population-based data. But the obvious limitation of our study is that time trend analysis for the evaluation of the relation between two health indicators is a relatively crude method. So any association discovered between Age-Specific Fertility Rates and adverse outcomes in our study doesn't imply any causality relationship. To confirm any causality relationship we recommend the implementation of studies with high level of evidence such as historical cohort or case-control study. Also our findings have many limitations to become generalized to Iranian population mainly because our data was gathered from only rural population of East Azerbaijan.

Another limitation is related to our data source in which doesn't contain many reproductive health indicators regardless of its strong reliability. Also to have a better judgment about any difference between health measures as an event rate before and after a widespread intervention such as family physician program we decide to use an appropriate model such as Poisson regression.²⁸

Conclusion

All in all, after implementation of family physician program and using skilled midwifery workforce in rural areas, the rates of the perinatal care and the occurrence of safe delivery were increased even for pregnancies outside the typical child-bearing ages and by more accurate implementation of integrated maternal and childcare and appropriate and timely referral system, the rates of child mortality and stillbirth have been obviously reduced. However, examining the causality relationship between pregnancies outside the typical child-bearing ages and incidence of LBW and mortality of premature and congenital malformed neonates requires further appropriate studies. Also decreasing

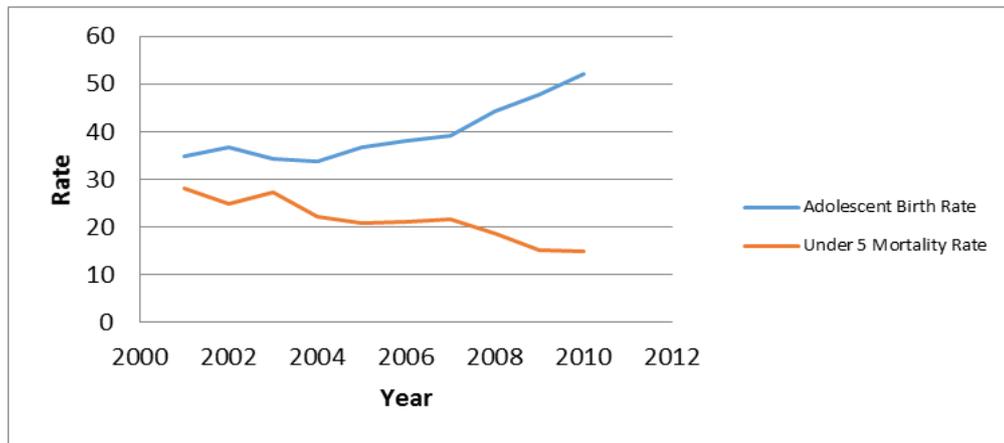


Figure 1. Adolescent birth rate and under five mortality rate of East Azerbaijan rural population; (2001 to 2010) trends

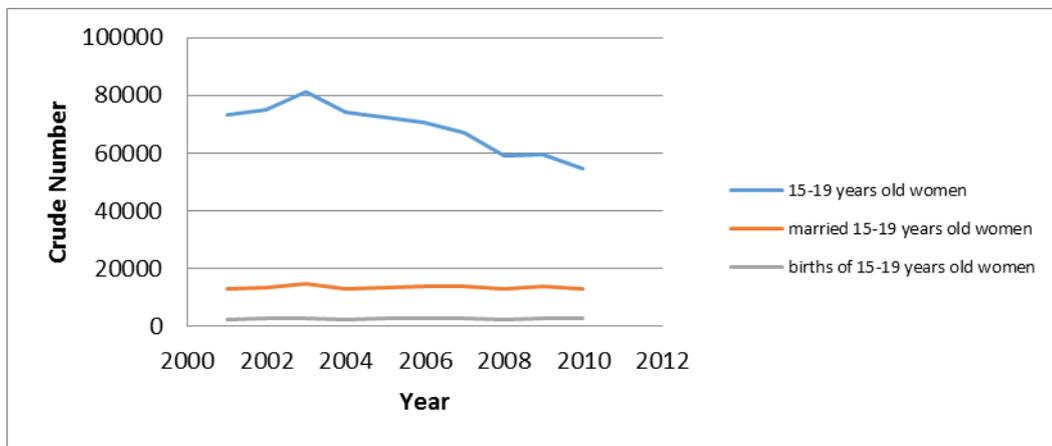


Figure 2. Adolescent number, marriage and birth rate of East Azerbaijan rural women; (2001 to 2010) trends

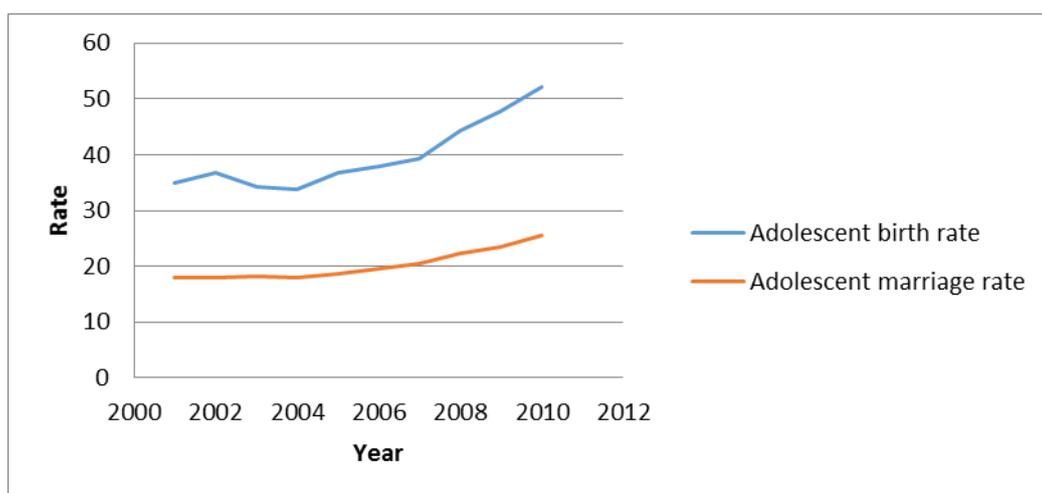


Figure 3. Adolescent marriage and birth rate of East Azerbaijan rural women; (2001 to 2010) trend

LBW deliveries should be regarded as a healthcare priority due to its long-term adverse outcomes.

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Ethical issues

None to be declared.

Conflict of interest

The authors declare no conflict of interest in this study.

References

1. Somerville M, Kumaran K and Anderson R. Health and illness. Public health and epidemiology at a glance. 1st ed. New York: Wiley-Blackwell 2012.
2. World Bank Health. Reproductive health: from advocacy to action. World Bank institute. 2012. Available from: <http://einstitute.worldbank.org/ei/course/reproductive-health-advocacy-action>
3. Millennium development goals indicators. United Nations site for the MDG Indicators. Available from: <http://mdgs.un.org/unsd/mdg/Default.aspx>
4. Chowdhury SA, Tandon A, Bos E, Mils S, Saadat S, Lie GS, Arias V. Better health for women and families. The World Bank's reproductive health action plan 2010-2015. Available from: <http://www.popline.org/node/217675>
5. Moghadam MN, Sadeghi V, Parva S. Weaknesses and challenges of primary healthcare system in Iran: a review. The International Journal of Health Planning and Management 2012; 27 (2): e121-e31. doi: 10.1002/hpm.1105
6. Jabbari birami H, Gasemzade H, Bakhshian F, Mohammadpourasl A,

- Asadzade R. Evaluation of family physician program based on family health indices. Knowledge & Health Journal 2012; 7 (3): 32-37: e124-e128. doi: 10.1234/knh.v7i3 .141
7. Mansourian M, Rastgari Mehr B, Kalantari Z, Mahram M, Hosainzadeh Milani M, Shafieyan Z, et al. The effects of family physician program on health indicators in rural population of Qazvin province, 2004-2010. Razi Journal of Medical Sciences 2014; 21(126): 27-31. (Persian)
8. Khadivi R, Kor A, Foruzandeh E. Comparing the main reproductive health indices in rural areas of Isfahan province, Iran, before and after family physician program intervention during 2001-2011. Journal of Isfahan Medical School 2014; 32 (286): 712-25. (Persian)
9. Barati O, Maleki MR, Gohari MR, Kabir MJ, Amireslami MR, Abdi Z. The impact of family physician program on health indicators in Iran (2003-2007). Payesh 2012; 11 (3): 361-63. (Persian)
10. Alipour A, Habibian N, Tabatabaee SHR. Evaluation the impact of family physician care program on family planning in SARI from 2003 to 2007. Iranian Journal of Epidemiology 2009; 5 (1): 47-55. (Persian)
11. Khosravi A, Motlagh M, Emami Razavi SH. The Iranian vital horoscope; appropriate tool to collect health statistics in rural area. Iranian Journal of Public Health 2009; 38 (suppl.1): 74-80.
12. Machin D, Campbel MJ, Walters SJ. P-values and statistical inference in: Medical Statistics. 4th ed. New Yourk: John Wiley & Sons Ltd. 2007.
13. Raeissi P, Ebadi Fard Azar F, Roudbari M, Shabani Kia HR. The impact of family physician program on mother and child health indices in rural population auspices of Mashhad University of Medical Sciences and

- health care services, Iran; 2009. *Journal of Health Administration* 2011; 14 (43):27-36. (Persian)
14. World health statistics 2014. Available from: www.who.int/mediacentre/.../2014/world-health-statistics-2014/en
 15. World Health Organization. Early marriages, adolescent and young pregnancies. Report by the secretariat. 2012. Available from: http://apps.who.int/gb/ebwha/pdf_files/WHA65/A65_13-en.pdf
 16. Aghajanian A. Family Planning Program and recent fertility trends in Iran. 1998. Available from: www.cpc.unc.edu/measure/publications/wp-98-04
 17. Madondo TT. Adolescent pregnancies and their impact on communities. Available from: www.popline.org/node/571831
 18. The United Nations Population Fund UNFPA. *Marrying to young. End child marriage.* 2012. Available from: <https://www.unfpa.org/sites/default/files/pub-pdf/MarryingTooYoung.pdf>
 19. The United Nations development programme. *Population, reproductive health and millennium development goals.* 2005. Available from: <http://www.unmillenniumproject.org/documents/SRHbooklet080105.Pdf>
 20. WHO. *Guidelines on preventing early pregnancy and poor reproductive outcomes among adolescents in developing countries. What the evidence says.* WHO 2011. Available from: http://apps.who.int/iris/bitstream/10665/70813/1/WHO_FWC_MCA_12_02_eng.pdf
 21. UNICEF. *Reduction of Low Birth Weight: a south Asia priority.* 2002. Available from: <http://www.unicef.org/rosa/Reduction.pdf>
 22. Fadupin GT, Pikuda YC. Maternal weight gain and pregnancy outcomes in adolescent girls in Ibadan, Nigeria. *Afr J Med Sci* 2011, 40 (3): 197-205.
 23. Chen XK, Wen SW, Fleming N, Demissie K, Rhoads GG, Walker M. Teenage pregnancy and adverse birth outcomes: a large population based retrospective cohort study. *International Journal of Epidemiology* 2007, 36 (2): 368-73. doi: 10.1093/ije/dyl284
 24. Bae J, Park JH, Park YK, Kim JY, Lee SW, Park SW. Changes in the distribution of maternal age and parity and increasing trends in the low birth weight rate in Korea between 1995 and 2005. *J Prev Med Public Health* 2011; 44 (3): 111-7. doi: 10.3961/jpmp.2011.44.3.111
 25. Khoshnood B, Wall S, Lee KS. Risk of low birth weight associated with advanced maternal age among four ethnic groups in the United States. *Matern Child Health J* 2005, 9 (1): 3-9.
 26. Vohr BR, Tyson JE, Wright LL, Perrit RL, Li L, Poole WK. Maternal age, multiple birth and extremely low birth weight infants. *J Pediatr* 2009, 15 (4): 498-503. doi: 10.1016/j.jpeds
 27. Cousens S, Blencowe H, Stanton C, Chou D, Ahmed S, Steinhardt L, et al. National, regional, and worldwide estimates of stillbirth rates in 2009 with trends since 1995: A systematic analysis. *Lancet* 2011; 377 (9774): 1319-30. doi: 10.1016/S0140-6736(10)62310-0
 28. Petrie A, Sabin C. *Medical statistics at a glance.* 3rd ed. New York: John Wiley & Sons Ltd. 2009.