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Original Article

Adequacy of prenatal care and its association with pregnancy outcomes: A comparison of indices in Tabriz, Iran

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Abstract

Introduction: Improving of mother and child health is one of the most important and essential roles of public health agencies and millennium development goals. The aim of this study was to determine rates of prenatal care (PNC) utilization in Tabriz, Iran, from 1994-2013 and compare the two most commonly used models of PNC utilized in determining the proportion of the pregnant woman receiving inadequate PNC and comparing use of two indices.

Methods: In this study, we conducted a descriptive cross-sectional study of 2834 women having a health record in care center of the rural region in Tabriz for 20 years. We used questioner that validated in the study Jabbari et al. for obtaining data. Random sampling quotes were done in 3 times during the years 1994-2013.

Results: We found that 53% of mothers received adequate care by adequate PNC utilization (APNCU) index, but 17% by revised-GINDEX index but the most important objective of our study was identifying the relationship between adequacy of PNC and pregnancy outcome. On the other hand, the study indicated that between inadequate care and low birth weight (LBW), mother weight gaining, birth height exists significant association, but there is no meaningful correlation between birth weight and adequacy of care ($P < 0.05$).

Conclusion: The study analyzed the effect of PNC utilization on birth outcomes and suggested that PNC decrease LBW through both increasing gestational age as well as improving fetal growth at the same time it improves birth height and mother weight gaining. All findings of this study emphasize the need for health policies to improve utilization and access PNC.

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Introduction

Nowadays improving of mother and child health is one of the most important and essential roles of public health agencies and millennium development goals.[1] The relationship between insufficient prenatal care (PNC) and poor pregnancy outcomes such as low birth weight (LBW) intrauterine growth restriction (IUGR) and preterm labor, still birth, infant mortality rate, mother gain weight during pregnancy has been widely investigated and shown. Adequate PNC is one of the national goals in the healthy people 2020.[2]

PNCs is defined preventive and management medicine related to pregnancy and delivery and a set of interventions that help to find and modify biomedical behavioral and social risk of women health and pregnancy

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outcome.[3] Accurate measurement of PNC depends on the accuracy of the index used.[4]

In the last two decades, some of the different prenatal utilization indices have been used and their comparability has not completely explored. These indices such as M-IOM (Modified indirect optimization method), OB-REC (Ocean Beach Recreation Center), PHS-REC (Population and Health Services Research Ethics Committee), GINDEX, revised-GINDEX (R-G) and adequate PNC utilization (APNCU), which assess the adequacy of PNC needs, take into consideration the month PNC began, the number of PNC visits, and the gestational age at delivery.[2,3]

From these indices two of them most commonly used APNCU and R-G because of more accuracy and comprehensiveness than others. APNCU index often referred to as the Kotelchuck index and proposed by ACOG (American Congress of Obstetricians and Gynecologists).[5] This index characterizes PNC utilization on two independent and distinctive dimensions: adequacy of initiation of PNC and adequacy of utilization of receiving services once PNC has begun, The APNCU Index categorizes care as inadequate (0-49% of expected visit), intermediate (50-79%), adequate (80-109%), or adequate plus (110%). The APNCU Index does not assess the quality of PNC that is delivered.[1,6] The R-G proposed by Alexander and Kotelchuck has 6 major categories of care. It has separate categories for no care and missing.[7] It is a revised version of the GINDEX and is said to be useful for "research focusing on birth outcomes and for monitoring trends in the proportion of cases with intensive use of PNC." It will also allow for an assessment of the adequacy of PNC use by the trimester in which care began.[3,8]

The R-G code requires the knowledge of 3 birth related outcomes: the Trimester PNC Began, the gestational age and the total number of PNC visits during pregnancy.[9] Numerous studies have attempted to explain the relationship between inadequate PNC and adverse pregnancy. Outcome such as LBW, ectopic pregnancy, abortion, IUFD (Intra-uterine fetal death), preterm labor and small for gestational age (SGA). Tayebi et al. showed that 36% of Iranian women in Mazandaran, Iran, had received inadequate PNC (with APNCU index and it has been suggested inadequate care increase preterm labor.[10]

The rate of inadequate care in various studies is different for example 8-9% in Canada. 18.0% in Kansas, 16.7% in United State and at all in the previous study rate of insufficient care reported between 9.2-20.1%[11,12] One study showed that inadequate care is associated with ectopic pregnancy and IUFD.[13] Most of the cross-sectional studies found a protective effect of PNC against LBW, whereas the results of studies with other designs were conflicting.[14-16]

As PNC is the best strategy to improving of mother and child health and there is no general agreement between the association of PNC and pregnancy outcome and no studies have compared the PNC utilization indices and information about PNC in our country are scant. Therefore, the aim of this study was to explore factors that determine rates of PNC utilization in Tabriz, Iran, from 1994-2013 and compare two most commonly used models of PNC utilized in determining the proportion of the pregnant woman receiving inadequate PNC. To identifying the association between inadequate PNC and preterm labor, LBW, mother weight gaining and comparing use of two indices. In addition, this report can inform local health department, policy makers, program planners that know how much adequate PNC is provided to a pregnant woman in Tabriz and identify the disparity in the provision of care.

Methods

This cross-sectional study was conducted with 2834 women who have health record in care centers of the rural region in Tabriz for 20 years that were recruited between years 1994-2013. We used a questionnaire for obtaining data that Validity and reliability of this questionnaire were approved by Jabbari et al. from Tabriz University of Medical Sciences.[17] All the mentioned variables in the questionnaire were obtained through family health profiles. Adequacy of PNC was

categorized with R-G index and APNCU that reflect number of visits received and the trimester PNC started throughout the mother's pregnancy, on the other hand these indexes consist of:

1. The APNCU index is comprised of two parts: the month in which PNC is initiated and the number of visits from initiation of care until delivery.

2. The R-G has six categories of care: no care, inadequate, intermediate, adequate, intensive, and missing.[17] Stratified random sampling in all health centers and private offices were done in 3 times during the years. Pregnant women in these centers from the 6th week of gestation until 3 months after delivery were included in our study.

The women lack of this eligibility criteria or unwilling to participate in this survey were excluded from the study. The study was approved by the Research Review Board of Tabriz University of Medical Sciences and health ethics protocols.

The main independent variable of interest in this research was PNC which consists of a combination of medical assessment and psychological counseling to help prevent pregnancy complications and main outcome of interest was LBW, preterm labor and SGA.

The analysis was conducted using Statistical Package for Social Sciences software version 16 and multivariable logistic regression was done to determine the association between inadequate PNC and adverse pregnancy outcomes. $P \leq 0.05$ and power of the statistical test 80% were considered respectively in our results.

Results

Of the 2834 pregnant women who took part in the study, the mean age of the mothers studied was 20.05 years [SD = 5.14 (Standard deviation)] and the mean number of pregnancy was 2.13 (SD = 1.57). The results further revealed that mean number of years of education was 8.9 (SD = 7.4). Educational level of the women showed that 21.0% of the total respondents had no formal education, while 39.2% had primary school certificate, 31.4% went to secondary school while only 6.0% of women had academic education. Most women in our study who received inadequate or intermediate PNC reported completing up to 12 years of education or more (64.0%) and were between 20 and 32 years of age (87.0%). Overall, PNC began after 3.55 ± 4.12 month of pregnancy and Numbers of prenatal visits were between 1 and 16. Mean of Maternal weight gaining during pregnancy was 8.11 ± 3.7 kg. Adequacy of PNC based on two indices APNCU and R-G groups is shown in table 1.

Results indicated that among women who received inadequate PNC, 4.9% of live births were LBW. The lowest rate of LBW was found for women with adequate PNC (3.1%) and Intensive PNC (3.7%). 53 [CI (Confidence interval) 95% 51.2-54.8] of mothers received adequate care by APNCU index while 17.0% (CI 95% 15.6-18.4) by R-G.

As mentioned above, the most important objective of our study was identifying the relationship between adequacy of PNC and pregnancy outcome that were obtained with multivariable logistic regression analysis and reported in table 2.

Using the APNCU index and R-G, between inadequate care and LBW, mother weight gaining, birth height was shown significant association but there was no meaningful correlation between birth weight and adequacy of care ($P > 0.05$).

Discussion

This study showed the highest percentage (23%) of care was delivered in adequate and intensive care groups that these findings were along with Alexander and Kotelchuch[3]

Table 1. Comparison the adequacy of PNC of two indices two indices APNCU and R-G

Index	No care	Inadequate	Intermediate	Adequate	Intensive	Total
APNCU index (%)	28 (1.0)	673 (23.7)	285 (10.1)	1518 (53.6)	330 (11.6)	2806 (99.0)
R-G index (%)	28 (1.0)	1238 (43.7)	946 (33.4)	467 (16.5)	155 (5.5)	2806 (99.0)

PNC: Prenatal care; APNCU: Adequate prenatal care utilization; R-G: Revised-GINDEX

Table 2. Association between adequacy of PNC and pregnancy outcome

Care index		Birth weight (g)	Birth high (cm)	Mother weight gain (g)	LBW (%)
APNCU index	No care	3389.60	50.19	8113.33	4
	Inadequate	3287.36	49.26	5921.17	4.9
	Intermediate	3319.58	49.46	7479.80	4.4
	Adequate	3306.33	49.65	8346.62	3.1
	Intensive	3277.73	49.69	1.0414	3.7
	P	> 0.05	< 0.05	< 0.05	< 0.05
R-G	No care	3389.60	50.19	8113.33	4
	Inadequate	3301.08	49.40	6782.16	4.2
	Intermediate	3304.22	49.66	8262.53	3.5
	Adequate	3300.14	49.65	9650.55	3.1
	Intensive	3263.62	49.66	10603.60	3.9
	P	> 0.05	< 0.05	< 0.05	< 0.05

LBW: Low birth weight; PNC: Prenatal care; APNCU: Adequate prenatal care utilization; R-G: Revised-GINDEX

was conducted that the most (43.0%) were received adequate care, while in the study of Krueger and Scholl[4] inadequate care APNCU index was 36.8% and in Heaman et al.[13] studies, adequate care was 77.6%.

Based on Kotelchuck study,[4] preterm labor in women with inadequate care was twice more than women with adequate or intermediate care and odds of LBW increase in women with inadequate PNC and low-risk that confirm our findings.

In a study McDonagh the principle cause of maternal mortality is identified as hemorrhage, sepsis, hypertension, abortion and hard labor. In addition to some biological factor include age less than 15 years and more than 35 years, and multi parity more than eight. However, their study could not find an association between PNC and pregnancy complications and death.[18] Early PNC and especially during the first trimester can identify mothers and child at risk for complications. This result is confirm our finding.[18]

Coria-soto et al, in a case control study found that 63.0% of pregnant women with inadequate PNC had IUGR and 51.0% had preterm labors and 80.0% of preterm labor with adequate and appropriate care were preventable that result were concurrent with our study among the other factors low information with delay in initiation of care, may be responsible for this results, Hence, improving mother knowledge is necessary.[19]

In the other study that were done in Mazandaran by Tayebi et al. 36% of pregnant women had inadequate care with APNCU index and preterm labor in inadequate care was 1.36 times more than adequate and intensive care (P < 0.05) and they investigated no association between APNCU index and maternal age, occupation, education, body mass index but they showed significant association between the time of first care, visit number, and labor type, routine laboratory test and number of sonography in pregnancy.[5]

The study had some limitations; one limitation was the lack of data on other potentially relevant covariate including smoking alcohol use and marital status. Several previous studies of PNC effectiveness have shown that including or excluding smoking and drug use in the birth outcome had no effect on the results for PNC effectiveness.

As mentioned in this study between two indices APNCU and R-G significant difference that this result align with all other studies.[12-18] Thus, different utilization patterns based on varying degrees of association of inadequate PNC with indices should be considered.

Most of studies demonstrated the effect of PNC utilization on birth outcomes and suggested that PNC decrease LBW through both increasing gestational age as well as improving fetal growth at the same time it improve birth height and mother weight gaining.[6-17]All findings of these studies emphasize the need for health policies to improve utilization and access PNC.

Conclusion

Selection of PNC utilization index for research or program evaluation requires careful consideration of the methodological

underpinning and the limitation of the chosen index. Although these indices remain useful for study trends in PNC utilization or evaluating the effectiveness of programs to enhance access to care, more refined futures indices should incorporate parameters that reflect the qualitative aspects of PNC in addition to measuring numbers of visits. Further studies should go beyond simply counting the number of visits and focus on the relationship between quality and content of PNC. Further studies and increasing provider focus is necessary to solving significant health problems and improve pregnancy outcomes and neonatal health.

Conflict of Interests

Authors have no conflict of interest.

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