Hemoglobin and hematocrit concentrations influence birth outcome in pregnant Polish adolescents

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Abstract

Objectives: With regard to the decreasing number of young mothers who give birth in Poland we decided to analyze retrospectively the relationship between hemoglobin and hematocrit concentration in 347 pregnant women aged 15-25 years treated in the DFMMG PMMHRI in Łódź in the period between 2000 and 2006. The study population was arranged into two groups: the research group of 111 pregnancies in the age between 15 and 18 and the control group of 236 adult women (19-25 yrs old). In the analysis we took into account: obstetric history, hemoglobin and hematocrit concentration, prevalence of anemia. Results: In the group of teenagers we observed a decreasing trend in number of deliveries. This trend occurred to be statistically significant. The prevalence of anemia in adolescents during pregnancy was higher than typically reported in adult women. In teenagers 11.97 g/dl, in control group 12.22 g/dl, the statistical difference was found significant (p = 0.033). Conclusions: 1) The prevalence of anemia in multiple regression analyses occurred higher in group of adolescents than in group of adult women before and after delivery. Differences in level of Hg in bought group after delivery was statistically important. 2) Inadequate prenatal care, history of self-reported cigarette use were significantly associated with lower hemoglobin during pregnancy

Key words: adolescents, pregnancy, hemoglobin, hematocrit

Introduction

With regard to the process of decreasing age of sexual initiation in Poland among young women, becoming pregnant and first birth, the problem of adolescent pregnancy and motherhood appears to become a serious social issue.

Currently the percentage of teenagers giving birth between the age of 14 and 19 is 7% of the birthrate in Poland. Between 2000 and 2007 a distinct decreasing trend concerning pregnancies and births of juvenile Poles was observed [1]. Such assumption was confirmed by results of analysis conducted by the Polish Ministry of Health from 1985 to 2004 concerning number of teenage women giving birth [1]. As an example, an absolute number of births given by teenage women in Poland in 1990 was as high as 44 thousand, in 2000 dropped down to 27 thousand while in 2004 was only a little over 20 thousand.

American research shows that about most of adolescent pregnancies are unplanned and only few are wanted. Among the most common causes of unplanned and premature motherhood, is lack of detailed knowledge about contraceptives as well as limited access and no funds for contraceptives. According to literature, about 26% of girls and 30% of boys, as the main source of information gives their peer group. The media is the only source of knowledge for about 26% of young people. Low social, economical and professional status is also significant in this matter.

Adolescent pregnancies are an important issue of contemporary perinatology. These pregnancies are burdened with a high risk of complications and they should always be treated very carefully. Among them abortion, premature birth, hypertension, low birth weight, and three times higher perinatal mortality are regarded as related to the young age of the mothers [2]. It is suggested that because of hypogenitalism and especially uterine hypoplasia, the age of 15 yrs is considered to be the critical point below which the perinatal mortality of newborns increases. Moreover, because of unfinished physical development and often occurring labor disproportion in adolescent patients, the percentage of caesarean sections within this group constitutes about 30% of all births.

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In addition to the fact that problem of relationship between hemoglobin and birth outcomes have not been well characterized in Polish adolescents, despite the fact that this group is at high risk of early childbearing, we decided to examine the association of maternal hemoglobin level during pregnancy and after birth. We were specifically interested in effects associated with low and high maternal hemoglobin levels.

The aims of the study were: 1) to describe the frequency of delivery in adolescents in DFMMG PMMHRI in Lodz in the period between 2000 and 2007; 2) to analyze the complications and outcome of pregnancy in Polish women giving birth before the age of 19; 3) to examine the difference in hematological markers (hemoglobin and hematocrit) in adolescent pregnancies in comparison to adults.

Material and methods

The data used in this analysis came from the registry of the DFMMG in the RIPMMH in Łódź (Poland) during the period between 2000 and 2006. Study population included 347 women aged 15-25 years. They were arranged into two groups: 15-18 years (n = 110) as the research group and 19-25 years (n = 235) as the reference one. Pregnant women were selected by stratified random sampling technique.

We took into account the average age of women giving birth and the frequency of deliveries in adolescents in the period 2000-2007 in PMMHRI. The measures of birth presented here are the standard ones. Rates are calculated as the number of events (birth) per 1000 women aged 15-18 per year. Reflecting date availability, age of the adolescents was measured as age at outcomes, not age at conception.

Separately we analyzed the hematological parameters in the mothers, both adolescent and controls, before delivery and right after. During pregnancy the highest level of hemoglobin concentration (Hb) and hematocrit (Hct) is observed between 12th and 28th week then these values decrease until the day of delivery. Anemia was defined using the criteria for anemia during pregnancy. With this criteria the concentration of Hb used to define anemia was 11 g/dl and the level of Hct was 33% [3].

Statistical methods

We use two sided tests and significance level 0.05 for statistical inferences. We assessed time trend for rates in adolescent pregnancies over years using Poisson regression with identity link and population size as offset. We used linear regression to compare Hb and Hct levels between age groups. All statistical analyses were performed using STATA 9.0 program.

Results

Out of 10,856 women giving birth between 2000 and 2006 in the DFMMG RIPMMH in Łódź (Poland) there were 111 (1%) teenagers up to the age of 18. According to our data collected in 2000, the population of women after delivery was 1446 patients out of which 22 were adolescent, in 2001 group of women after delivery consisted of 1332 patients among which 15 were adolescents, in 2002 the numbers were respectively 1237 and 17 were adolescents, in 2003: 1598 and 12 adolescents; 2004: 1774 and 18; 2005: 1692 and 11 teenagers; 2006: 1777 out of which 15 were below 18 years old (Fig. 1). The birth rate among examined adolescents during the period 2000-2006 was very low (15 deliveries per 1000 adolescents in 2000, 12 per 1000 in 2001, 13 per 1000 in 2002, 7 per 1000 in 2003, 10 per 1000 in 2004, 6 per 1000 in 2005 and 8 per 1000 in 2006. In this group during this 7 years of observation we observed a decreasing trend in numbers of deliveries (Fig. 1) this trend occurred to be statistically significant (p = 0.013).

Considering examination of the Hb and Hct level as a routine due to increasing risk of anemia during pregnancy and puerperium, an analysis regarding this subject in case of adolescent women was also conducted (Table 1).

In the population of women under 18 anemia occurred more frequently both before pregnancy and after the delivery in comparison to the reference group of women aged 19-25 (Table 1). In case of adolescent women the hemoglobin level before the delivery was as high as 11.97 (se = 0.17) and in the reference group 12.22 (se = 0.086), (p = 0.140). However, in values of
Table 1. Hematological parameters in adolescent pregnancies and adults before and after delivery

<table>
<thead>
<tr>
<th>Hematological parameters</th>
<th>Age ≤18</th>
<th>Age 18-25</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 102</td>
<td>n = 232</td>
<td></td>
</tr>
<tr>
<td>Hb before delivery</td>
<td>12.0 (0.15)</td>
<td>12.2 (0.086)</td>
<td>0.140</td>
</tr>
<tr>
<td>Hb after delivery</td>
<td>10.3 (0.17)</td>
<td>10.7 (0.1)</td>
<td>0.033</td>
</tr>
<tr>
<td>Hct before delivery</td>
<td>34.7 (0.40)</td>
<td>36.3 (0.25)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Hct after delivery</td>
<td>31.5 (0.45)</td>
<td>32.36 (0.27)</td>
<td>0.096</td>
</tr>
<tr>
<td>Hb/Hct before delivery</td>
<td>0.350 (0.004)</td>
<td>0.337 (0.002)</td>
<td>0.003</td>
</tr>
<tr>
<td>Hb difference after delivery</td>
<td>-1.7 (0.19)</td>
<td>-1.5 (0.11)</td>
<td>0.43</td>
</tr>
<tr>
<td>Hct difference after delivery</td>
<td>-3.4 (0.45)</td>
<td>-4.0 (0.28)</td>
<td>0.25</td>
</tr>
</tbody>
</table>

n – number of woman, Hb hemoglobin concentration (g/dl)
Hct – hematocrit concentration (L/L)
in parentheses standard error of the mean

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post term hemoglobin in teenagers 10.3 (se = 0.17) and in control group 10.7 (se = 0.1) the statistical difference was found significant (p = 0.033).

The level of Htc in cases of teenagers was 34.7 (se = 0.40) before delivery and 31.5 (se = 0.45) after delivery (Table 1). Analogically, 36.3 (se = 0.25) before and 32.36 (se = 0.27) after the delivery in case of women aged 18-25. The analysis of pre-delivery values of levels of hematocrit showed significant difference (p = 0.001) in those two groups. Post-delivery hematocrit values did not vary in teenagers and in adult women (p = 0.096).

The level of Hb/Hct before delivery was 0.350 (se = 0.004) in adolescents woman and 0.337 (se = 0.002) in adult women (Table 1). The statistical difference was significant (p = 0.003). However, the Hb and Hct difference after delivery was Hb = -1.7 (se = 0.19), Hct = -3.43 (se = 0.45), (p = 0.43) in research group and Hb = -1.6 (se = 0.11), Hct = -4.04 (se = 0.28), (p = 0.25) in the reference group.

Comment

The group of adolescent mothers 18 is very diversified. It consists from both – girls from pathological families, undernourished, abusing alcohol or drugs and from families with high socio-economic status [4]. Regardless of the family background, in this age group we often deal with unwanted pregnancies [5] in case of unmarried women.

On the basis of conducted research and statistical analysis, it can be stated that the pregnancy in women under the age of 18 have a higher risk of medical complications [6, 7] involving mother and child. The incidents of low birth weight (< 2500 g) is more than double the rate for adults, and the neonatal death rate (within 28 days of birth) is almost three times higher [8]. The mortality rate for the mother [9], although low, is twice that for adult pregnant woman [10]. Adolescent pregnancy has been associated with other medical problems including poor maternal weight gain, prematurity anemia and sexually transmitted diseases. Young adolescents mothers are more likely then other groups to give birth to underweight infants.

Moreover, in case of teenage mothers, high level of immaturity in social and psychological aspect can be observed. Girls are often forced to be single mothers, put their children in the care of grandparents or uncles. They often give up their education and they are not capable of gaining financial stabilization for themselves or their children. Lack of care and support, the ignorance of contraceptive methods are the reasons why they often become pregnant yet again.

Adolescent pregnancy is the problem with occurs in all societies, but the level of teenage pregnancy and childbearing varies from country to country.

In the literature we have a lot of well documented pattern of decline in the adolescent birthrate in the industrialized countries over the past 25 years [11]. As well as in the other countries, it can be seen that the number of pregnancies and deliveries of adolescent Polish women decreases significantly (Fig. 1). It is confirmed by the results of statistic analysis conducted between 1985 and 2004, considering the number of deliveries of teenagers in Poland, conducted by the Ministry of Health [1]. As an example, the total number of births given by teenage mothers in 1990 was 44 thousand, in 2000 was 27 thousand and in 2004 only a little over 20 thousand. Adolescent birth rates in 1990 in Poland was 31.5 per 1000. A similar situation occurred in Canada 25.6 per 1000, England and Wales 33.2 per 1000 [11].
In addition, in the United States the rate among white teenagers was one of the highest among the developed countries 59.9 per 1000. The range in the birth rate across industrialized countries is very wide for example in Japan rate was reported very low 3.6 per 1000 [11].

Another important fact with we noticed during the study are huge differences between birth rate among teenagers 15-17 years old. In this group in most of the countries (Australia, Canada, England and Wales) the rate was low (about 9-10 per 1000). The birth rate among older adolescents 18-19 years old was much higher (35-49 per 1000) This situation can be connected with the fact that the abortion ratio among younger girls was higher in the majority of countries.

The general decreasing trend of motherhood in teenagers was connected with number of factors likely to have had a greater impact on adolescents. For example sexual education in schools, improved knowledge about contraception [12]. Despite increasing use of contraception by teenagers at the time of first intercourse 50% of adolescent pregnancies occur within the first 6 month of initial sexual intercourse [13].

Another important problem that is strictly related to the birth outcomes in adolescent mothers is anemia and hemoglobin and hematocrit concentrations [14]. In the present paper we checked the relationship between anemia, level of hemoglobin and hematocrit during pregnancy had been related to iron deficiency [15] and multiple pregnancies occurring more often in this group. Also, as our research show, lower birth weight of children born by adolescent mothers is closely connected with decreased level of Hb and Hct in the pre-delivery period and therefore insufficient nutrition of girls during pregnancy, childbirth and during breast feeding.

The analysis of proportion of Hb/Hct in research group and control group is also interesting. During the research, we indicated a statistical difference between mature women and teenagers. In case of mature women
the proportion was lower which is most probably caused by greater blood flow which influence more frequent occurrence of swelling in the last trimester of the pregnancy in case of control group.

References


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