

## Urban-rural differences in premature birth levels in Shkodra region

Artan Mesi<sup>1</sup>, Arjan Bregu<sup>2</sup>, Herion Muja<sup>2</sup>, Genc Burazeri<sup>3</sup>

<sup>1</sup>Regional Health Directorate, Shkoder, Albania;

<sup>2</sup>Institute of Public Health, Tirana, Albania;

<sup>3</sup>Department of International Health, School for Public Health and Primary Care (CAPHRI), Faculty of Health, Medicine and Life Sciences, Maastricht University, Maastricht, The Netherlands.

**Corresponding author:** Dr. Artan Mesi

Address: Regional Health Directorate, Shkoder, Albania;

Telephone: + 355692097523; E-mail: artanmesi@yahoo.com

### Abstract

**Aim:** Our aim was to assess the association of premature births with place of residence (urban areas vs. rural areas) independent of several maternal socio-demographic characteristics and behavioral factors in Shkoder, which constitutes the main region in north Albania.

**Methods:** A case-control study was conducted in Shkodra region including all premature births (cases: N=343) and a representative sample of full-term births (controls: N=372) occurring during the period January 2014 – December 2015. Data on maternal place of residence, other socio-demographic characteristics and behavioral factors was collected for all women included in the study. Binary logistic regression was used to assess the independent association of premature births with maternal place of residence.

**Results:** The proportion of rural residence was considerably higher among women with premature births compared with their counterparts who experienced full-term births (56.6% vs. 35.2%, respectively;  $P < 0.001$ ). Upon full adjustment for all maternal socio-demographic characteristics (age, education, employment and income) and behavioral factors (smoking, alcohol consumption and body mass index), there was evidence of a strong and significant association between preterm births and maternal rural residence (OR=1.5, 95%CI=1.1-2.2).

**Conclusion:** Our findings indicate an excess risk for premature births among rural residents in Shkodra region, irrespective of maternal socio-demographic characteristics and behavioral factors. Health professionals and policymakers in Albania should implement effective measures and programs in order to control and prevent premature births.

**Keywords:** place of residence, pregnant women, premature birth, rural areas, Shkoder, urban areas.

## Introduction

Premature birth, a global public health challenge, is considered one of the most important single causes of the global burden of diseases in the neonatal period (1,2). Several maternal socio-demographic and behavioral factors have been reported as important determinants of premature births including older age (3), low socioeconomic status (4) and smoking (5,6).

In Albania, there is evidence of a general declining trend of the under-five child mortality in the past two decades (7,8). However, child mortality has declined to a greater degree than infant mortality (7). This continuous decline has been mainly attributed to improvements in children's environments brought about by health interventions, or general improvements in living standards (7). According to a recent analysis (1), key factors that have contributed in the decrease of child deaths during 1990-2013 include fertility rates, maternal education, HIV/AIDS, income, and secular trends. In Central Europe and Albania, secular trends that include new drugs, vaccines, diagnostic procedures and public health campaigns, count for the biggest shift in child mortality rates (7). The second most important influencing factor is fertility, followed by mother education and income (1). Specifically for Albania, secular trends have accounted for a decrease of 13,000 child deaths from 1990 to 2010 compared with 134,000 child deaths in the overall Central European countries (7). Likewise, there has been a reduction of 13,000 child deaths due to fertility compared to 71,000 in the whole Central Europe. In turn, maternal education accounted for a decrease of 4,000 child deaths in Albania as opposed to 35,000 child deaths in the whole Central Europe (1).

Nevertheless, there are no specific scientific reports about the prevalence and determinants of preterm births in transitional Albania. The information about northern regions of the country is even more scarce compared especially with Tirana. In this context,

the objective of this study was to assess the association of premature births with place of residence (urban areas vs. rural areas) independent of several maternal socio-demographic characteristics and behavioral factors in Shkoder, which constitutes the main region in north Albania.

## Methods

A case-control study was conducted in the region of Shkodra during the period 2014-2015. Cases consisted of all the premature births pertaining to the Regional Hospital of Shkoder during the period January 2014 – December 2015. During this two-year period, overall, there were recorded 3343 births at the Regional Hospital of Shkoder. Of these, 343 were premature births, which constituted 10.3% of the overall number of births occurring at the Regional Hospital of Shkoder during the study period. In turn, the control group consisted of a representative sample of full-term births, which was drawn consecutively in line with the occurrence of premature births. In due course, it was decided to invite 400 controls (women who experienced full-term deliveries). Of 400 women with full-term deliveries who were targeted for recruitment, 372 of them participated in the study, providing a 93% response rate (372/400) in the control group.

A structured questionnaire was administered to all women who participated in this study. The questionnaire included data about demographic factors and socioeconomic characteristics, as well as lifestyle/behavioral factors. Socio-demographic factors consisted of age (in the analysis dichotomized into: <35 years vs. ≥35 years), place of residence (urban areas vs. rural areas), employment status (dichotomized into: employed vs. unemployed), educational attainment and self-perceived income level (both trichotomized into: low, middle and high). On the other hand, behavioral factors consisted of smoking and alcohol consumption (both dichotomized into: no vs. yes),

as well as the body mass index [BMI, trichotomized into: <25.0 [normal weight], 25.0-29.9 (overweight) and  $\geq 30$  (obesity)].

The study was approved by the Faculty of Medicine in Tirana. All women who agreed to participate were explained in sufficient detail the aim and procedures of the study.

Independent samples t-test was used to compare the mean age between women with premature births and those with full-term births. Conversely, Fisher's exact test was used to compare the distribution of maternal place of residence between women with premature births and those with full-term births. On the other hand, binary logistic regression was used to assess the association of premature births (outcome variable) with maternal place of residence (main independent variable). Initially, crude (unadjusted) odds ratios (ORs) and their respective 95% confidence intervals (95% CIs) were calculated. Subsequently, age-adjusted models were run (with age introduced as a binary/dichotomous variable: <35 years vs.  $\geq 35$  years). Next, logistic regression models were adjusted for all socio-demographic characteristics [age, educational attainment (low, middle and high), employment status (employed vs. unemployed) and income level (low, middle and high)]. Finally, logistic regression models were adjusted for all socio-demographic characteristics and behavioral/lifestyle factors [smoking (yes vs. no), alcohol consumption (yes vs. no) and BMI (<25.0, 25.0-29.9 and  $\geq 30$ )]. Multivariable-adjusted ORs and their respective 95% CIs were calculated. In all cases, a p-value of  $\leq 0.05$  was considered as statistically significant. Hosmer-Lemeshow goodness-of-fit test was used to assess the validity of the multivariable-adjusted logistic regression models (9). Statistical package for Social Sciences

(SPSS, version 17.0) was used for all the statistical analyses.

## Results

Overall, mean age of study participants was  $28.2 \pm 6.0$  years; it was significantly higher in women with premature births than in those with full-term births ( $30.4 \pm 6.1$  years vs.  $26.3 \pm 5.2$  years, respectively; independent samples t-test:  $P < 0.001$ ).

Overall, 390 (54.5%) women were from urban areas, whereas the remaining 325 (45.5%) were from rural areas. The proportion of rural residence was considerably higher among women with premature births compared with their counterparts who experienced full-term births (56.6% vs. 35.2%, respectively; Fisher's exact test:  $P < 0.001$ ) [data not shown].

Table 1 presents the association of preterm births with maternal place of residence (urban areas vs. rural areas). In crude (unadjusted) logistic regression models (model 1), there was evidence of a strong positive association between premature births and maternal rural residence (OR=2.4, 95%CI=1.8-3.2). Adjustment for age (dichotomous variable: <35 years vs.  $\geq 35$  years) [presented in model 2] attenuated the findings (OR=1.7, 95%CI=1.2-2.4). Further adjustment for all socio-demographic factors (educational attainment, employment status and income level) [presented in model 3] weakened the relationship (OR=1.5, 95%CI=1.1-2.1). Nevertheless, upon full adjustment for all socio-demographic characteristics and lifestyle/behavioral factors (smoking, alcohol consumption and BMI) [presented in model 4], the association between preterm births and maternal rural residence remained strong and statistically significant (OR=1.5, 95%CI=1.1-2.2).

**Table 1. Association of premature births with maternal place of residence (urban areas vs. rural areas)**

Model	OR*	95%CI*	P*
<b>Model 1<sup>†</sup>:</b>			
Urban areas	1.00	reference	<0.001
Rural areas	2.39	1.77-3.24	
<b>Model 2<sup>‡</sup>:</b>			
Urban areas	1.00	reference	0.001
Rural areas	1.72	1.24-2.39	
<b>Model 3<sup>¶</sup>:</b>			
Urban areas	1.00	reference	0.026
Rural areas	1.49	1.05-2.12	
<b>Model 4<sup>§</sup>:</b>			
Urban areas	1.00	reference	0.022
Rural areas	1.53	1.06-2.19	

\* Odds ratios (OR: premature birth vs. full-term birth), 95% confidence intervals (95%CI) and p-values from binary logistic regression.

<sup>†</sup> Model 1: crude (unadjusted) model.

<sup>‡</sup> Model 2: age-adjusted model.

<sup>¶</sup> Model 3: adjusted for all socio-demographic characteristics (age, educational attainment, employment status and income level).

<sup>§</sup> Model 4: adjusted for all socio-demographic characteristics and lifestyle/behavioral factors (smoking, alcohol consumption and body mass index).

There was evidence of a significant interaction between place of residence and maternal smoking (p-value of the interaction term: P=0.049), but not with the alcohol consumption (data not shown in the table).

## Discussion

The main finding of this study consists of a strong and statistically significant relationship between premature births and maternal rural residence in Shkoder, which is the main region in north Albania. The association remained unabated after adjustment for a wide range of demographic and socioeconomic characteristics, as well as selected behavioral/lifestyle factors including smoking habits, alcohol intake and overall overweight and obesity. The finding about a positive relationship between maternal rural residence and premature births has not been frequently reported in the scientific

literature pertinent to the European region. This is due to the significantly higher urbanization levels in the Member States of the European Union, but also due to different models of health care provision in these countries compared with post-communist Albania which is still characterized by a high proportion of rural population (accounting for about 50% of the overall population).

Our findings related to a positive association of premature births with maternal rural residence bear important policy implications in the Albanian context. A previous report from Albania has indicated that, in rural areas, there has been a slight increase in the number of primary health care physicians in the past two decades (from 3.5 per 10000 population in the year 2000 to 3.7 physicians per 10000 population in 2012) (10). Compared to the national average, however, in Shkodra region there has been a smaller increase in the number of primary health care

physicians (from 2.9 per 10000 population in 2000 to 3.0 per 10000 population in 2012) (10). Of note, at a national level, there has been a gradual narrowing of the urban-rural differences in the number of primary health care physicians in Albania. Hence, in 2000, the excess number of family physicians in urban areas compared with the rural areas of Albania was 9 per 100000 population, whereas in 2012 this difference was only 2 per 100000 population (10). Furthermore, in both urban areas and rural areas of Albania, there has been evidence of a significant increase in the number of the overall primary health care visits performed by family physicians. Hence, in rural areas of Albania, the overall number of primary health care visits increased from 1001990 in 2005 to 1863592 in 2012 with evidence of a significant linear trend (11). Yet, compared to the national average, Shkodra region has experienced a lower increase in the number of primary health care visits (11). In any case, determinants of the excess risk of premature births in rural areas of Shkodra and presumably in other regions of Albania should be sought and explained in further more vigorous studies.

The current study may have some limitations including the possibility of selection bias (in the control group), information bias (the data collected through the questionnaire), as well as the study design employed. This study included all women with

premature births over the period 2014-2015 at the Regional Hospital of Shkoder and a representative sample of women with full-term births. From this perspective, there is no reason to assume selection bias among cases, a possibility which cannot be entirely excluded for the control group regardless of the efforts made to ensure representativeness of the sample with the overall births occurring during the study period. In any case, findings from this study cannot (and should not) be generalized to the overall women in Albania, as this study was confined to Shkodra region only. Furthermore, while the information on place of residence is pretty objective and robust, the data collected through interviews may have been prone to information bias, at least to some extent. This may be the case for behavioral factors such as smoking and alcohol intake which, to a certain degree, constitute sensitive information. Also, findings from case-control studies are not assumed to be causal.

In conclusion, notwithstanding some potential limitations, our findings indicate an excess risk of premature births among rural residents in Shkodra region, irrespective of maternal socio-demographic characteristics and behavioral factors. Health professionals and policymakers in Albania should implement effective measures and programs in order to control and prevent premature births.

**Conflicts of interest:** None declared.

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