ORIGINAL ARTICLE

Annals of Agricultural and Environmental Medicine
www.aaem.pl

Perinatal outcomes in multiparous women. The impact of urban and rural residence – a retrospective analysis from Poland

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A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical revision of the article, F – Final approval of the article

Szyszka M, Rzońca E, Gałazkowski R, Rzońca P. Perinatal Outcomes in Multiparous Women: The Impact of Urban and Rural Residence – A Retrospective Analysis from Poland. Ann Agric Environ Med. doi:10.26444/aaem/209638

Abstract

Introduction and Objective. Multiparous women may experience additional health problems due to their past pregnancies. Place of residence has a significant impact on the health of the mother and her newborn baby, including on perinatal outcomes. Therefore, understanding the differences in perinatal outcomes between women living in rural and urban areas is crucial for shaping health promotion and public health measures. The aim of the study is to examine the association between place of residence and selected perinatal outcomes in multiparous women.

Materials and Method. This retrospective study was based on an analysis of the electronic medical records of women who gave birth at St. Sophia's Hospital in Warsaw, Poland, between January 2017 – December 2021. The study included only multiparous women. The data analysed included place of residence, medical procedures performed and perinatal outcomes.

Results. Multiparous women living in rural areas were more likely to give birth prematurely (OR=1.73) and have caesarean delivery (OR=1.21). They were also more likely to have spinal anaesthesia (OR=1.22) and amniotomy (OR=1.23). Babies born to mothers living in rural areas tended to be of lower birth weight (3,480 vs 3,500 grams) than babies born to women living in urban areas.

Conclusions. The study showed that multiparous women living in rural areas are more likely to experience perinatal complications and undergo different medical procedures during labour than women living in urban areas. The findings demonstrate the need for differentiated perinatal care interventions for women living in rural and urban areas.

Key words

parity, place-of-residence characteristics, perinatal outcomes, rural areas, urban areas

INTRODUCTION AND OBJECTIVE

The number of live births a woman has experienced is referred to as parity. Women who have had two or more pregnancies resulting in live births are called multiparous [1]. According to Statistics Poland, in 2023, there were 272 thousand live births in Poland. A total of 52.2% of live births in urban areas and 59.8% of live births in rural areas were by multiparous women [2]. In 2024, Poland saw a negative natural change of –157,000 people. The country's urban areas have been in a position of negative natural change for more than 20 years, with the exception of 2008 – 2011. In 2024, there were 107,000 more deaths than births in urban areas, compared with 50,000 more deaths than births in rural areas. Despite the unfavourable demographic trends, rural areas saw net internal migration of more than 42.2,000 in 2024 [3]. Historically, people living in rural areas have been subject to greater health problems than those living in urban areas, most likely due to poorer access to and utilisation of health services [4].

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Received: 30.05.2025; accepted: 18.08.2025; first published: 08.09.2025

Place of residence may be a crucial determinant of health for multiparous women, who may experience additional health problems due to their past pregnancies. Studies have shown that in both rural and urban areas there are specific challenges in relation to health care provision. Although people living in urban areas often have better access to health services, they may also have higher stress levels and experience greater social inequalities, which can additionally affect their health. People living in rural areas tend to have lower stress levels, but they may experience limited access to health care. In addition, the health services available in rural areas are often less adapted to the specific needs of pregnant women [5–7]. Research has shown that women of reproductive age living in Polish rural areas are less likely to adhere to health recommendations – such as folic acid supplementation, physical exercise and reducing alcohol consumption – during pregnancy [8]. However, there has been a significant improvement in the living conditions of reproductive-age women residing in rural areas, where recent years have seen a noticeable increase in *per capita* income and improvement in housing standards and technical infrastructure. However, regional differences persist despite these positive changes [9]. Place of residence plays an important role in shaping health outcomes, including perinatal outcomes, of women

and their newborns. Therefore, it is especially important to understand the differences in perinatal outcomes between women living in urban and rural areas [5–7].

OBJECTIVE

The aim of the study was to examine the association between place of residence (rural vs urban) and selected perinatal outcomes in multiparous mothers and their newborn infants. The study analyses demographic and clinical data to assess whether place of residence has a significant impact on perinatal outcomes. Findings from the study can help better understand the health needs of women and identify areas requiring systemic interventions.

MATERIALS AND METHOD

The study was based on a retrospective analysis of the electronic medical records of women who gave birth at St. Sophia Hospital in Warsaw, Poland, between 1 January 2017 – 31 December 2021.

All multiparous women, i.e. women having their second or subsequent birth, were included in the study, and categorised into those living in urban and rural areas. Exclusion criteria: gaps in the medical records regarding the data analysed, multiple pregnancy, stillbirth, severe neonatal birth defects and abnormal karyotype.

Medical records relating to a total of 30,171 births were analysed, of which 16,097 cases – multiparous women – met the inclusion criterion for the analysis. After application of the exclusion criteria, a total of 15,338 cases were included in the final analysis.

The anonymized database included the following information: age, place of residence, marital status, level of education, past obstetric history, course of pregnancy, labour and birth parameters.

Ethics. The study design was approved by the Bioethics Committee at the Medical University of Warsaw (Approval No. AKBE/112/2022). The data analysed were anonymized and did not permit the identification of the patients at any stage of the study.

Statistical analysis. The data collected were analysed statistically using IBM SPSS Statistics v. 25.0 for Windows (IBM, Armonk, New York, USA). Categorical variables are reported as numbers (n) and percentages (%), whereas continuous variables are presented as medians (Me) and interquartile ranges (IQR). The normality of the distribution of continuous variables was tested using the Kolmogorov-Smirnov test and the Lilliefors test. Categorical variables were compared using the chi-square test, whereas continuous variables were compared using the Mann-Whitney U-test. Differences in odds between the two groups analysed were assessed using odds ratios (OR) with 95% confidence intervals (CI 95%). Statistical significance was set at $p<0.05$.

RESULTS

Multiparous women living in rural areas were younger (M=33 vs 34 years) and were more likely to have primary (2.79% vs 2.18%) or secondary (15.88% vs 10.71%) education, and be married (89.13% vs 85.28%) than women living in urban areas (Tab. 1).

Statistical analysis showed a statistically significant relationship between the place of residence of the women included in the study and whether or not they received thromboprophylaxis, presence or absence of hypothyroidism, anaemia and foetal hypotrophy, whether or not a pessary was used, and result of the GBS test ($p<0.05$). Women living in rural areas had higher odds for receiving thromboprophylaxis (OR=1.26; 95% CI=1.15–1.39), developing anaemia (OR=1.15; 95% CI=1.04–1.27), foetal hypotrophy (OR=1.38; 95% CI=1.09–1.74), receiving a pessary (OR=1.51; 95% CI=1.14–2.00), absence of a GBS test result (OR=1.14; 95% CI=1.00–1.29), and had lower odds for hypothyroidism (OR=0.85; 95% CI=0.77–0.95) and a positive GBS test (OR=0.89; 95% CI=0.80–0.99) (Tab. 2).

Table 3 shows the analysis of associations between place of residence of the women included in the study and selected birth variables. The analysis showed that multiparous women living in rural areas had higher odds of pre-term birth (OR=1.73; 95% CI=1.45–2.05) and caesarean section (OR=1.21; 95% CI=1.10–1.33). They also had more pregnancies and deliveries compared to multiparous women living in urban areas. Moreover, women living in rural areas were more likely to have had spinal anaesthesia (OR=1.22; 95% CI=1.11–1.34) and amniotomy (OR=1.23; 95% CI=1.02–1.48), and less likely to have experience a first-degree perineal tear (OR=0.86; 95% CI=0.78–0.95).

Babies born to multiparous mothers living in rural areas tended to be of a lower birth weight than babies born to mothers living in urban areas. They also had higher odds of having an Apgar score of 7 or less at 1 minute (OR=1.53;

Table 1. Analysis of associations between place of residence and selected demographic variables

Variables	Total n = 15 338	Rural area n = 2 475	Urban area n = 12 863	*p*-value	OR (95% CI)
Age – Me (IQR)	34 (31–36)	33 (31–36)	34 (31–36)	0.000	-
Education – n (%)					
Primary	349 (2.28)	69 (2.79)	280 (2.18)	0.000	1 (ref.)
Secondary	1771 (11.55)	393 (15.88)	1378 (10.71)		1.17 (0.88–1.57)
Higher	13218 (86.18)	2013 (81.33)	11205 (87.11)		0.74* (0.57–0.97)
Marital status – n (%)					
Single	2163 (14.10)	269 (10.87)	1894 (14.72)	0.000	1 (ref.)
In a relationship	13175 (85.90)	2206 (89.13)	10969 (85.28)		1.42 (1.24–1.63)

Me – mean; IQR – interquartile rang; OR – odds ratio; 95% CI – 95% confidence interval; * $p<0.05$

Table 2. Analysis of associations between place of residence and selected maternal health variables

Variables	Total n=15 338 n (%)	Rural area n=2 475 n (%)	Urban area n=12 863 n (%)	*p*-value	OR (95% CI)
Cholestasis of pregnancy	174 (1.13)	26 (1.05)	148 (1.15)	0.667	0.91 (0.60-1.39)
Thromboprophylaxis	3774 (24.61)	702 (28.36)	3072 (23.88)	0.000	1.26 (1.15-1.39)
Pre-eclampsia	88 (0.57)	20 (0.81)	68 (0.53)	0.919	1.53 (0.93-1.53)
Gestational hypertension	410 (2.67)	70 (2.83)	340 (2.64)	0.601	1.07 (0.83-1.39)
Hypertension	195 (1.27)	39 (1.58)	156 (1.21)	0.140	1.30 (0.92-1.86)
Thrombocytopenia	1633 (10.65)	267 (10.79)	1366 (10.62)	0.804	1.02 (0.88-1.17)
Hashimoto's disease	1391 (9.07)	205 (8.28)	1186 (9.22)	0.140	0.89 (0.76-1.04)
Hypothyroidism	3652 (23.81)	531 (21.45)	3121 (24.26)	0.003	0.85 (0.77-0.95)
Hyperthyroidism	64 (0.42)	8 (0.32)	56 (0.44)	0.428	0.74 (0.35-1.56)
Gestational diabetes	2112 (13.77)	370 (14.95)	1742 (13.54)	0.063	1.12 (0.99-1.27)
Anaemia	3883 (25.32)	682 (27.56)	3201 (24.89)	0.005	1.15 (1.04-1.27)
Foetal hypotrophy	443 (2.89)	92 (3.72)	351 (2.73)	0.007	1.38 (1.09-1.74)
Pessary	282 (1.84)	63 (2.55)	219 (1.70)	0.004	1.51 (1.14-2.00)
History of miscarriage	4143 (27.01)	667 (26.95)	3476 (27.02)	0.940	1.00 (0.90-1.10)
GBS test					
Negative	8569 (55.87)	1291 (52.16)	7278 (56.58)	0.000	1 (ref.)
Positive	3680 (23.99)	613 (24.77)	3067 (23.84)		0.89* (0.80-0.99)
No swab taken	3089 (20.14)	571 (23.07)	2518 (19.58)		1.14* (1.00-1.29)

OR – odds ratio; 95% CI – 95% confidence interval; GBS – Streptococcus agalactiae
* p<0.05

95% CI=1.20–1.96), 3 minutes (OR=1.51; 95% CI=1.08–2.12) and 5 minutes (OR=1.65; 95% CI=1.04–2.61), and were at higher risk of requiring NICU admission (OR=1.38; 95% CI=1.22–1.57). The associations identified were statistically significant (p<0.05) (Tab. 4).

DISCUSSION

The place of residence has a significant impact on a person's health. The present study showed significant differences in selected perinatal outcomes, both maternal and neonatal, between multiparous women living in rural and urban areas. The two groups of women analysed also differed in terms of socio-demographic variables. Women living in rural areas were statistically significantly younger (median age 33 vs 34 years; $p<0.001$) and were more likely to have primary or secondary education (18.67% vs 12.89%; $p<0.001$), and be married than women living in urban areas (89.13% vs 85.28%; OR=1.42). The findings are consistent with those in the literature. More than 70% of mothers in a study by Putri et al. were aged 20–24 years and unemployed and 63.6% were living with their husbands. Almost one-third were aged under 19 when they first became pregnant. A study by Wallenborn et al. found an association between rural maternal residence and lower maternal education: only 5.0% of mothers living in rural areas had higher education, compared with 27.1% of those living in small urban areas and 36.8% of those residing in large urban areas [10, 11]. Socio-demographic characteristics, such as younger maternal age, lower education levels, and living in a rural area have repeatedly been identified as independent risk factors for adverse perinatal outcomes. The consistency of the present findings with those of previous international studies strengthens their reliability, and highlights the need to adapt perinatal care strategies to the specific needs of women residing in rural areas.

The present study shows that multiparous women living in rural areas are at higher risk for anaemia (OR=1.15), foetal hypotrophy (OR=1.38), and requiring thromboprophylaxis (OR=1.26) and a pessary, compared to women living in urban areas. Similar findings were reported by Kitengie et al., who found an association between foetal hypotrophy and such factors as parity and place of residence [12]. Findings from a study by Mehrnoush et al. among pregnant women living in rural and urban areas are also relevant. The study showed that mothers living in rural areas were at higher risk for anaemia (aOR=2.02), pre-term birth (aOR=1.81), post-term pregnancy (aOR=1.5), low neonatal birth weight (aOR=1.89), and need for neonatal resuscitation (aOR=2.66) [13]. The present study also shows that women living in rural areas have a lower risk of hypothyroidism (OR=0.85) and a positive GBS test (OR=0.89). Interestingly, it was also found that women residing in rural areas were more likely not to be tested for GBS (OR=1.14). These findings may reflect differences in access to healthcare, including diagnostic tests, and health awareness between women living in rural and urban areas, which indicates the need for further research.

The present study shows that women living in rural areas had more pregnancies and deliveries than women living in urban areas. Moreover, they were more likely to have a caesarean section (OR=1.21), spinal anaesthesia (OR=1.22) and amniotomy (OR=1.23), and less likely to experience a first-degree perineal tear (OR=0.86). The findings are in contrast to those of Rodrigo-Gallardo et al., who found that living in a rural area (aOR=1.93) and having a history of 3 or more births (aOR= 1.36) are associated with increased risk of non-institutional delivery, where the possibility to perform a

Table 3. Analysis of associations between place of residence and selected birth variables

Variables	Total n=15 338 n (%)	Rural area n=2 475 n (%)	Urban area n=12 863 n (%)	*p*-value	OR (95% CI)
Place of birth					
Hospital	13272 (86.53)	2187 (88.36)	11085 (86.18)	0.004	1 (ref.)
Community birth	2066 (13.47)	288 (11.64)	1778 (13.82)		0.82 (0.72-0.94)
Term of delivery					
Term birth	14607 (95.23)	2297 (92.81)	12310 (95.70)	0.000	1 (ref.)
Pre-term birth	731 (4.77)	178 (7.19)	553 (4.30)		1.73*** (1.45-2.05)
Gravidity					
Second	8376 (54.61)	1229 (49.66)	7147 (55.56)	0.000	1 (ref.)
Third	4215 (27.48)	717 (28.97)	3498 (27.19)		1.19** (1.08-1.32)
Fourth	1632 (10.64)	297 (12.00)	1335 (10.38)		1.29*** (1.13-1.49)
Fifth or more	1115 (7.27)	232 (9.37)	883 (6.86)		1.53*** (1.31-1.79)
Parity					
Second	11079 (72.23)	1617 (65.33)	9462 (73.56)	0.000	1 (ref.)
Third	3168 (20.65)	630 (25.45)	2538 (19.73)		1.45*** (1.31-1.61)
Fourth	766 (4.99)	163 (6.59)	603 (4.69)		1.58*** (1.32-1.90)
Fifth or more	325 (2.12)	65 (2.63)	260 (2.02)		1.46** (1.11-1.93)
Labour type					
Physiologic	10874 (70.90)	1669 (67.43)	9205 (71.56)	0.000	1 (ref.)
C-section	4362 (28.44)	785 (31.72)	3577 (27.81)		1.21*** (1.10-1.33)
Intervention	102 (0.67)	21 (0.85)	81 (0.63)		1.43 (0.88-2.32)
Induction	2455 (16.01)	400 (16.16)	2055 (15.98)	0.818	1.01 (0.90-1.14)
Spinal anaesthesia	4303 (28.05)	780 (31.52)	3523 (27.39)	0.000	1.22 (1.11-1.34)
Epidural anaesthesia	2900 (18.91)	463 (18.71)	2437 (18.95)	0.781	0.98 (0.88-1.10)
Amniotomy	792 (5.16)	150 (6.06)	642 (4.99)	0.028	1.23 (1.02-1.48)
Episiotomy	1645 (10.72)	247 (9.98)	1398 (10.87)	0.191	0.91 (0.79-1.05)
Perineal laceration	4370 (28.49)	639 (25.82)	3731 (29.01)	0.001	0.85 (0.77-0.94)
Perineal laceration degree					
First	4204 (27.41)	622 (25.13)	3582 (27.85)	0.000	0.86* (0.78-0.95)
Second	126 (0.82)	13 (0.53)	113 (0.88)		0.57 (0.32-1.02)
Third and Fourth	40 (0.26)	4 (0.16)	36 (0.28)		0.55 (0.20-1.56)
Uterine curettage	779 (5.08)	144 (5.82)	635 (4.94)	0.067	1.19 (0.99-1.43)
Labour duration (min) – Me (IQR)	240 (175–320)	238 (175–320)	240 (180–320)	0.183	-

Me – mean, IQR – interquartile rang; OR – odds ratio; 95% CI – 95% confidence interval; * $p<0.05$; ** $p<0.01$; *** $p<0.001$

number of medical procedures is limited [14]. In their study, Giang et al. identified place of residence as a factor associated with the rate of caesarean sections, which was higher for women living in urban areas. Mothers residing in urban areas had 1.25 times higher odds of caesarean section compared to mothers living in rural areas. The study also showed that the rate of caesarean sections among the first-time mothers included in the study was as high as that among women who had given birth previously (aOR: 1.38) [15]. A study by Tadese et al. including multiparous women, showed that women living in rural areas were up to 8 times more likely to have adverse perinatal outcomes than those living in urban areas [16]. It seems that further studies are needed to understand these findings as they may be associated with both differences in health awareness, and differences in access to perinatal education.

In the present study, multiparous women living in rural areas were found to be at higher risk of preterm birth (OR=1.73). A similar association was found in a systematic review by Bizuayehu et al., who found that babies born to mothers living in rural areas are more likely to be preterm and have low birth weight [7]. A study by Li et al. suggests that women living in urban areas may be at increased risk of pre-term labour due to high levels of air pollution [17].

According to the literature, maternal place of residence is also an important factor having an impact on neonatal birth weight. Studies by Mehrnoush et al. showed that living in a rural area is associated with increased risk of low neonatal birth weight [13]. In a study by Mekie & Taklual, the odds of giving birth to a low birth weight (LBW) baby were found to be lower for urban residents, compared to rural residents (AOR=0.32) [18]. The findings are consistent with those from the current study, which shows that babies born to multiparous mothers living in rural areas tend to be of a lower birth weight than babies born to multiparous mothers living in urban areas.

Table 4. Analysis of associations between place of residence and selected neonatal variables

Variables	Total n=15 338 n (%)	Rural area n=2 475 n (%)	Urban area n=12 863 n (%)	*p*-value	OR (95% CI)
Birth weight (grams) – Me (IQR)	3500 (3200-3790)	3480 (3160-3780)	3500 (3200-3790)	0.012	-
1-min APGAR score					
≤7	381 (2.48)	86 (3.47)	295 (2.29)	0.001	1.53 (1.20-1.96)
>7	14957 (97.52)	2389 (96.53)	12568 (97.71)		1 (ref.)
3-min APGAR score					
≤7	196 (1.28)	44 (1.78)	152 (1.18)	0.016	1.51 (1.08-2.12)
>7	15142 (98.72)	2431 (98.22)	12711 (98.82)		1 (ref.)
5-min APGAR score					
≤7	100 (0.65)	24 (0.97)	76 (0.59)	0.032	1.65 (1.04-2.61)
>7	15238 (99.35)	2451 (99.03)	12787 (99.41)		1 (ref.)
NICU transfer	1710 (11.15)	348 (14.06)	1362 (10.59)	0.000	1.38 (1.22-1.57)

Me – mean; IQR – interquartile rang; OR – odds ratio; 95% CI – 95% confidence interval

The Apgar score is an important indicator of neonatal health. A study by Mgaya et al. showed that multiparity and low neonatal birth weight are independent predictors significantly correlated with a low Apgar score [19]. This is consistent with findings from the present study, which showed that babies born to multiparous mothers living in rural areas had a higher risk of having an Apgar score of 7 or less at 1 minute (OR=1.53), 3 minutes (OR=1.51) and 5 minutes (OR=1.65). Moreover, the present study shows that babies born to mothers living in rural areas had a higher risk of requiring NICU admission (OR=1.38), compared to babies born to mothers living in urban areas. Similarly, a study by Mehrnoush et al. found that neonates born to mothers living in rural areas were more likely to require NICU admission (aOR=1.98) [13].

The differences in the health status of multiparous mothers and their newborns depending on place of residence (urban vs rural), as found in the present study, may be due to a number of factors, such as differences in socio-economic status. Women residing in urban areas usually have a higher socio-economic status, which is often associated with higher education qualifications, greater job security and better financial opportunities, which in turn has an impact on access to healthcare services. In contrast, women living in rural areas often experience significant barriers to access to timely and appropriate healthcare. These include greater distance from healthcare facilities, limited number of and access to specialists, and limited infrastructure. Moreover, there is an association between education and health awareness, participation in health programmes and healthy lifestyle behaviours [13, 19–22]. This requires further research to gain deeper insight into these differences. A better understanding of these differences will help optimise health care by increasing awareness among people responsible for the organisation of care of women in the perinatal period and their newborn babies. It may also help develop effective health education strategies tailored to the specific needs of women living in urban and rural areas.

Limitations of the study. The study limitations are mainly due to its retrospective and single-centre nature, which may limit the generalisability of the findings to other populations. Moreover, the study did not analyse certain socio-economic factors which could have an impact on perinatal outcomes. This is due to the fact that the variables analysed in the study were obtained from medical records, which do not include such data. Therefore, further multicentre, prospective studies are required to confirm the findings of the presented study.

CONCLUSIONS

The study shows that place of residence has a significant impact on the perinatal outcomes of multiparous mothers and their newborns. Multiparous women living in rural areas were younger, had lower education levels, were more likely to be married, and were at a higher risk for perinatal complications and the need for medical interventions during labour. Their newborns were more likely to havea low birth weight and require NICU admission.

Findings from the study suggest that it is necessary to improve access to perinatal care and implement targeted prevention measures for women living in rural areas. It is also important to tailor health education programmes to the specific needs of this group of women to reduce health inequalities.

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