ORIGINAL ARTICLE

Annals of Agricultural and Environmental Medicine
www.aaem.pl

Impact of antenatal education on episiotomy, haemogram decline, caesarean rate, and neonatal intensive care needs in nulliparous women – an urban-rural comparison

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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

Önder D, Doğan A, Hamzaoğlu EB, Koca E, Eryılmaz AI, Özdemir Ö, Küçük Kent N, Kuyrukluyıldız N. Impact of antenatal education on episiotomy, haemogram decline, ceasarean rate, and neonatal intensive care needs in nulliparous women – urban-rural comparison. Ann Agric Environ Med. doi:10.26444/aaem/222341

Abstract

Introduction and Objective. Antenatal schools reduce anxiety by preparing women for the birth process, promote vaginal delivery, and strengthen maternal–infant adaptation. The literature indicates that prenatal education preserves pelvic floor health, stabilizes haemogram values, and decreases neonatal risks. The aim of the study is to examine the effects of antenatal school participation in term nulliparous pregnant women on episiotomy degree, haemogram changes, caesarean section indication, and neonatal intensive care unit (NICU) requirement, and to investigate the role of urban–rural settlement differences in educational access and birth outcomes.

Materials and Method. A total of 50 nulliparous pregnant women (25 participants, 25 non-participants) were compared. Episiotomy, haemogram, caesarean section, and NICU data were analyzed using Fisher's Exact, Chi-square, t-test, and Mann–Whitney U test ($p < 0.05$).

Results. In the participant group, gestational age was longer, haemogram values were higher, episiotomy degrees milder, and NICU requirement was lower ($p < 0.05$). Although birth weight and Apgar scores did not show significant differences, values were slightly higher in the participant group. Moreover, easier access to education among urban residents positively influenced outcomes, whereas limited access in rural areas created disadvantages.

Conclusion. Antenatal education demonstrates protective effects on haemogram, reduces episiotomy degree, and decreases NICU requirement. Urban–rural differences are decisive in educational access and birth outcomes.

Key words

antenatal school, nulliparous pregnant women, haemogram decline, neonatal intensive care, urban and rural settlements

INTRODUCTİON

Childbirth is generally conceptualized in the literature as a positive life experience and defined as a unique, exceptional phase in a woman's life [1]. It is considered a 'life-shaping turning point' and a structural transition ritual in the construction of maternal identity [2, 3]. While childbirth is a transformative experience that enhances strength, pride, and self-confidence for many women, for others it is remembered as a challenging process associated with intense anxiety, fear, helplessness, and dissatisfaction. Research demonstrates that both positive and negative birth experiences exert long-term effects on maternal adaptation, mental health, relationships, and bonding with the infant [4, 5].

In this context, prenatal education provides a valuable opportunity not only to equip expectant mothers with practical knowledge and coping mechanisms, but also to foster realistic expectations regarding the birth experience [6]. Globally, prenatal care services became routine in the early 20th century. The pioneering work of British physician Grantly Dick-Read in the early 1900s laid the foundations of prenatal education. In Turkey, the origins of pregnancy education programmes date back to the 1960s, with the first childbirth preparation classes established in the 1980s, and widespread adoption reported particularly after the 2000s [7, 8].

Today, the main factors driving participation in antenatal schools include the search for reliable professional knowledge, the desire to share the process with a partner, self-confidence in managing childbirth, and the need to develop bodily awareness. The literature reveals that well-designed antenatal education can reduce women's anxiety, enhance self-efficacy, and often improve the birth experience. Therefore, it is crucial that programme content encompasses both medical and psychosocial dimensions, actively involves partners, and

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Received: 31.01.2026; accepted: 22.05.2026; first published: 27.05.2026

extends into the postpartum period [9–11]. Moreover, reducing fear of childbirth plays a critical role in increasing vaginal delivery rates and strengthening maternal–infant adaptation [12]. Comprehensive physical and social support mechanisms offered in antenatal schools have the potential to promote normal vaginal delivery, reduce caesarean section rates, and consequently lower operative delivery-related complications and neonatal intensive care unit (NICU) requirements [13, 14].

The effects of prenatal care on haematological parameters are also emphasized in the literature. A retrospective study conducted in Romania demonstrated that women receiving regular prenatal care and iron supplementation had significantly higher postpartum haemoglobin levels and lower rates of moderate/severe anaemia [15]. Similarly, early initiation of pelvic floor rehabilitation and pain management methods has been reported to significantly reduce episiotomy frequency, the need for oxytocin induction, and caesarean delivery rates [16]. Studies in Iran revealed that pregnancies in rural areas carry higher maternal and neonatal risk profiles compared to urban settlements [17]. Research in China showed that multidisciplinary perinatal education for rural primiparas strengthened birth preparedness and psychological well-being, reduced caesarean sections due to maternal indications, and promoted vaginal delivery [18].

The decisive role of urban–rural settlement differences in access to antenatal education programmes results in heterogeneous maternal and neonatal health outcomes. In this regard, the present study aims to contribute to the literature by evaluating the effectiveness of health services and highlighting access limitations in rural areas. Specifically, it investigates the effects of antenatal school participation in term nulliparous pregnant women on episiotomy/laceration degree, changes in haemogram parameters, caesarean indications, and NICU requirements.

MATERİALS AND METHOD

Study design and setting. A prospective, comparative study was conducted at the State Hospital in Gümüşhane, Turkey. A total of 50 nulliparous women who delivered between December 2025 – February 2026 were included.

Eligibility criteria

Inclusion criteria:
- nulliparous women (first pregnancy);
- term pregnancy (≥37 weeks);
- singleton gestation;
- completion of routine antenatal follow-up.

Exclusion criteria:
- multiple pregnancies;
- preterm (<37 weeks) or post-term (>42 weeks) deliveries;
- previous pelvic surgery;
- chronic systemic disease (e.g., diabetes, hypertension).

Group allocation. Participants were divided into two groups:
- **Antenatal education group (n=25):** Women who attended at least four sessions of the Pregnancy School programme.
- **Non-attendance group (n=25):** Women who did not participate in any antenatal education programme.

Data collection. Demographic and clinical variables (age, height, weight, gestational weight gain, place of residence [urban/rural], number of antenatal visits, comorbidities) were recorded. Birth outcomes were assessed using the following parameters:
- episiotomy/laceration degree (grades 1–3);
- haemogram decline (difference in haemoglobin before and after delivery, g/dl);
- caesarean section rate;
- neonatal intensive care unit (NICU) admission (yes/no).

Statistical analysis. Data were analyzed using SPSS version 25.0.
- Chi-square test was applied for categorical variables.
- Independent samples t-test or Mann–Whitney U test was used for continuous variables.
- Fisher's Exact test was used to measure the significance of the relationship between two categorical variables in small samples.
- Statistical significance was set at $p<0.05$.

Ethical considerations. The study protocol was approved by the Ethics Committee of Gümüşhane University (Approval No: E-95674917–108.99–386536, dated 09.12.2025). Written informed consent was obtained from all participants.

RESULTS

The birth outcomes of 25 nulliparous pregnant women who attended antenatal school and 25 who did not were comparatively examined. Data regarding the participants' birth process were evaluated in terms of settlement (urban/rural), episiotomy and/or laceration degree, haemogram decline, caesarean section rate, neonatal intensive care unit (NICU) requirement, and other clinical parameters. Findings were analyzed using appropriate statistical methods to reveal significant differences between groups.

Table 1 presents the numerical data obtained in the study, showing certain differences between nulliparous women who attended and those who did not attend antenatal school. The mean maternal age was 28.2 ± 4.9 years in the non-participant group and 27.0 ± 3.6 years in the participant group. Regarding mean weight, the participant group had higher values (80.0 ± 11.0 kg) compared to the non-participant group (76.0 ± 10.0 kg). Gestational age was 38.5 ± 0.9 weeks in non-participants and 39.2 ± 0.9 weeks in participants; birth week was 38.6 ± 0.9 and 39.2 ± 0.9 weeks, respectively. Mean birth weight was 3095 ± 280 g in non-participants and 3140 ± 410 g in participants. Apgar scores were high in both groups, recorded as 8.9 ± 0.4 in non-participants and 9.0 ± 0.0 in participants. Haemogram values before delivery were similar (non-participants: 12.6 ± 1.3; participants: 12.9 ± 1.2), but post-delivery values were higher in the participant group (11.4 ± 1.3) compared to the non-participant group (10.2 ± 1.2). These findings suggest that antenatal school participation may prolong gestation, preserve postpartum haemogram values, and contribute to more physiological birth outcomes (Tab. 1).

Table 2 evaluates categorical variables, revealing distinct differences between groups. The majority of non-participants lived in rural areas (64%), whereas most participants resided in urban areas (80%). In terms of antenatal follow-up, all participants underwent 10 or more check-ups (100%), while

Table 1. Continuous variables (participants vs. non-participants)

Variable	Group	N	Mean ± SD	Median	Min	Max
Maternal age	Non-participant	25	28.2 ± 4.9	29	19	38
	Participant	25	27.0 ± 3.6	26	21	33
Maternal weight (kg)	Non-participant	25	76.0 ± 10.0	72	60	105
	Participant	25	80.0 ± 11.0	78	60	107
Gestational week	Non-participant	25	38.5 ± 0.9	39	37	40
	Participant	25	39.2 ± 0.9	39	37	40
Birth weight (g)	Non-participant	25	3095 ± 280	3105	2349	3770
	Participant	25	3140 ± 410	3125	2130	3790
Apgar score	Non-participant	25	8.9 ± 0.4	9	7	9
	Participant	25	9.0 ± 0.0	9	9	9
Haemogram decrease (pre-delivery)	Non-participant	25	12.6 ± 1.3	12.7	9.2	14.6
	Participant	25	12.9 ± 1.2	12.9	9.9	15.2
Haemogram decrease (post-delivery)	Non-participant	25	10.2 ± 1.2	10.1	6.9	12.4
	Participant	25	11.4 ± 1.3	11.3	8.9	13.8

Table 2. Categorical variables (frequency and %)

Variable	Option	Non-participant (n=25)	Participant (n=25)
Place of residence	Rural	16 (%64)	5 (%20)
	Urban	9 (%36)	20 (%80)
Height	1.70+	2 (%8)	2 (%8)
	1.60–1.70	13 (%52)	16 (%64)
	1.50–1.60	9 (%36)	7 (%28)
	Other	1 (%4)	0 (%0)
Gestational weight gain	0–10 kg	8 (%32)	10 (%40)
	10–15 kg	13 (%52)	9 (%36)
	15+ kg	4 (%16)	6 (%24)
Number of antenatal visits	5–10	7 (%28)	0 (%0)
	10+	18 (%72)	25 (%100)
Smoking	None	25 (%100)	25 (%100)
Comorbidity	Present	2 (%8)	1 (%4)
	Absent	23 (%92)	24 (%96)
Miscarriage/stillbirth history	Present	3 (%12)	4 (%16)
	Absent	22 (%88)	21 (%84)
Delivery mode	Vaginal	25 (%100)	23 (%92)
	Cesarean	0 (%0)	2 (%8)
Caesarean indication	None	25 (%100)	23 (%92)
	Arrest of labor	0 (%0)	2 (%8)
Episiotomy	Yes	25 (%100)	23 (%92)
	No	0 (%0)	2 (%8)
Episiotomy grade	Grade 1	0 (%0)	14 (%56)
	Grade 2	12 (%48)	11 (%44)
	Grade 3	13 (%52)	0 (%0)
NICU admission	Yes	11 (%44)	3 (%12)
	No	14 (%56)	22 (%88)

this rate was 72% among non-participants. Regarding gestational weight gain, 24% of participants gained ≥15 kg compared to 16% of non-participants. All non-participants delivered vaginally (100%), while 8% of participants underwent caesarean section due to non-progressive labour. Episiotomy was performed in all non-participants (100%) and in 92% of participants. Notably, episiotomy degree differed: non-participants experienced grade 2 (48%) and grade 3 (52%) lacerations, whereas participants had milder outcomes with grade 1 (56%) and grade 2 (44%). NICU requirement was 44% in non-participants but decreased to 12% in participants. These findings indicate that antenatal school participation positively influences both maternal and neonatal outcomes, particularly by reducing episiotomy severity and NICU need (Tab. 2).

Table 3 summarizes statistical comparisons, showing significant differences in certain variables between groups. No significant differences were found in maternal age, weight, birth weight, Apgar score, pre-delivery haemogram values, smoking, comorbidities, history of miscarriage/stillbirth, mode of delivery, caesarean indication, episiotomy status, or total gestational weight gain ($p > 0.05$). However, gestational age ($t(47) = 2.91$; $p = 0.006$) and post-delivery haemogram values ($t(48) = 3.21$, $p = 0.002$) were significantly higher in the participant group. Settlement ($\chi^2 = 7.12$, $p = 0.008$) and number of antenatal visits ($\chi^2 = 7.89$, $p = 0.005$) also showed significant differences favoring participants. Episiotomy degree differed markedly ($U = 120$; $p < 0.001$), with lower-grade episiotomies observed in participants. NICU requirement was 44% in non-participants versus 12% in participants, a statistically significant difference ($\chi^2 = 6.12$; $p = 0.013$). These results demonstrate that antenatal school participation prolongs gestation, preserves postpartum haemogram values, reduces episiotomy severity, and lowers NICU requirement (Tab. 3).

Table 3. Statistical comparisons

Variable	Test Used	Test statistic	p-value	Significance (p<0.05)
Maternal age	Independent samples t-test	t(48)=0.95	0.34	Not significant
Maternal weight	Independent samples t-test	t(48)=1.45	0.15	Not significant
Gestational week	Independent samples t-test	t(47)=0,56	0.70	Not significant
Birth weight	Independent samples t-test	t(48)=0.47	0.64	Not significant
Apgar score	Mann-Whitney U	U=275	0.12	Not significant
Hemogram decrease (pre-delivery)	Independent samples t-test	t(48)=0.82	0.41	Not significant
Haemogram decrease (post-delivery)	Independent samples t-test	t(48)=3.21	0.002	**Significant**
Residence	Chi-square	χ^2=7.12	0.008	**Significant**
Height	Chi-square	χ^2=2.45	0.29	Not significant
Gestational weight gain	Chi-square	χ^2=0.84	0.65	Not significant
Antenatal visits	Chi-square	χ^2=7.89	0.005	**Significant**
Smoking	Fisher's Exact	–	1.00	Not significant
Comorbidity	Fisher's Exact	–	0.55	Not significant
Miscarriage/stillbirth history	Fisher's Exact	–	0.72	Not significant
Delivery mode	Fisher's Exact	–	0.31	Not significant
Caesarean indication	Fisher's Exact	–	0.31	Not significant
Episiotomy	Fisher's Exact	–	0.24	Not significant
Episiotomy grade	Mann-Whitney U	U=120	<0.001	**Significant**
NICU admission	Chi-square	χ^2=6.12	0.013	**Significant**

DISCUSSION

The effects of antenatal schools (antenatal education programmes) on antenatal follow-up frequency, episiotomy rates, participation levels from urban and rural areas, caesarean section rates, and neonatal outcomes have been comprehensively examined in the literature, and the findings of this study were discussed in comparison with those reports.

According to the findings of the current study, a significant difference was observed between antenatal school participation and the number of antenatal visits. All participants underwent ≥10 antenatal visits, whereas this rate was lower among non-participants. Although existing studies do not directly demonstrate that antenatal school participation increases the number of visits, they indicate that antenatal education groups tend to have more regular and frequent follow-ups. Socio-demographic factors, such as education level and access to health services, are emphasized as strong determinants of visit frequency [7, 19, 20]. In this context, the significant difference observed in this study supports the role of antenatal education programmes in enhancing the regularity of antenatal follow-up.

The presented findings complement meta-analysis results in the literature. In the meta-analysis by Zaman et al. (2025), antenatal education significantly reduced cesarean section rates (RR = 0.80) and increased vaginal delivery rates (RR = 1.10), while no significant difference was found in episiotomy rates between groups. The same meta-analysis also highlighted the effects of antenatal education in reducing fear of childbirth, increasing self-efficacy, and lowering caesarean rates [14]. The current study supports these findings with biomedical outcomes, particularly demonstrating positive effects of antenatal education on episiotomy severity, haemogram decline, and NICU requirement. The absence of differences in episiotomy rates in the meta-analysis, contrasted with the reduction in severity in this study, suggests that antenatal education may yield different outcomes in different contexts. Furthermore, some programmes have been reported to reduce neonatal complications and NICU requirements [7, 21, 22]. These findings are not generalizable to all antenatal education types. Thus, the presented study indicates that antenatal education may exert protective effects not only on fear of childbirth and caesarean rates, but also on biomedical outcomes such as maternal blood loss and neonatal intensive care requirement.

The current findings also support the decisive role of education level, income status, and access to health services in birth outcomes. Particularly, lower education levels and limited access to health services among rural women lead to fewer antenatal visits and poorer birth outcomes. In this study, urban participants who attended antenatal school had more regular antenatal follow-ups, milder episiotomy degrees, and reduced NICU requirements. These findings are consistent with Yıldırım's (2024) study in Turkey, which reported that low education levels and restricted access to health services in rural areas negatively affect birth outcomes [23]. Similarly, Mehrnoush et al. (2020) in Iran found significantly higher rates of preterm birth, post-term pregnancy, maternal anaemia, low birth weight, and NICU requirement among rural mothers [17]. The current study supports these findings, showing that antenatal education and regular antenatal follow-up are critical interventions for improving birth outcomes, particularly in rural and disadvantaged populations. Therefore, expanding antenatal education programmes, increasing access to health services, and focusing on rural birth outcomes emerge as fundamental strategies for improving maternal and neonatal health.

Regarding episiotomy, the current findings align with the literature but reveal a different dimension. Although episiotomy was performed in both groups, the participant group had lower degrees of episiotomy, and in some cases, episiotomy was not required. A study conducted in Turkey reported significantly lower episiotomy rates in the antenatal education group (41.7%) compared to the control group (54.9%) [16]. This positive outcome was associated with pelvic floor exercises and pain management techniques taught during education. Although episiotomy rates did not differ in the current study, the reduction in severity indicates that antenatal education may produce different outcomes depending on context. Nevertheless, further evidence-based studies are needed to clarify the effects of antenatal education on episiotomy and laceration degrees.

The results obtained in this study demonstrate that antenatal education programmes exert significant effects on biomedical outcomes of childbirth. Specifically, the reduction in episiotomy severity, decreased postpartum haemogram decline, and lower NICU requirement, highlight the clinical protective role of antenatal education. Existing evidence supports its role in enhancing self-efficacy, reducing fear of childbirth, and increasing vaginal delivery rates; however, its effects on episiotomy rate/severity, blood loss, and NICU requirement remain mostly neutral or inconclusive in international literature [14, 24, 25]. In this context, the three specific outcomes observed in the current study (episiotomy severity, haemogram decline, and NICU requirement) provide valuable and novel contributions to the literature. Nevertheless, further well-designed, multicentre studies are required to confirm the generalizability of these results and to elucidate underlying mechanisms.

The findings obtained in this study also show that antenatal school participation indirectly but significantly affects maternal haemogram values. The mean pre-delivery haemogram was 12.6 ± 1.3 in non-participants and 12.9 ± 1.2 in participants. Post-delivery haemogram values decreased to 10.2 ± 1.2 in non-participants, but remained higher at 11.4 ± 1.3 in participants. These results support the role of antenatal education programmes in reducing blood loss and preserving haemogram values by promoting regular prenatal care. The literature similarly reports that insufficient prenatal care increases maternal anaemia and lowers haemoglobin levels, whereas women receiving regular prenatal care have higher haemoglobin levels and lower anaemia rates [15]. Other studies have shown positive correlations between antenatal education and maternal blood parameters [26, 27]. Thus, the presented study demonstrates that antenatal education exerts beneficial effects not only on psychosocial outcomes, but also on biomedical parameters such as haemogram values and blood loss.

The current findings also support the role of antenatal education in reducing NICU admission, the requirement for which were 44% in non-participants and 12% in participants. This result indicates that antenatal education contributes not only to psychological preparation and birth experience, but also to the prevention of neonatal complications. Although direct statistical data on NICU requirement are limited in the literature, studies report higher Apgar scores and

fewer neonatal complications among educated groups [28]. Insufficient or late prenatal care has been shown to increase NICU admission, prematurity, and perinatal mortality [29–31]. Therefore, the presented study provides new and valuable contributions to the literature regarding the effects of antenatal education on NICU requirement and neonatal complications.

Although no statistically significant differences were found between groups in birth weight and Apgar scores, values were slightly higher in the participant group. The mean birth weight was 3,095 ± 280 g and Apgar score 8.9 ± 0.4 in non-participants, compared to 3,140 ± 410 g and 9.0 ± 0.0 in participants. While these differences were not statistically significant, they suggest a possible protective trend in neonatal outcomes. The literature shows that higher birth weight and Apgar scores are associated with reduced neonatal risks in larger populations [32, 33]. Thus, the small differences observed in this study may indicate indirect positive effects of antenatal education on neonatal outcomes, warranting further research with larger samples.

Many contemporary studies examine the positive effects of antenatal schools/classes on pregnancy adaptation, fear of childbirth, caesarean rates, anxiety, and related outcomes [7, 34, 35].

Practical implications. The findings of this study suggest that antenatal education programmes such as Pregnancy School have direct clinical benefits beyond informational support. Participation was associated with reduced episiotomy severity, lower haemogram decline, and fewer NICU admissions, highlighting their role in improving maternal and neonatal outcomes. These results indicate that antenatal education should be standardized and integrated into routine prenatal care, particularly in rural areas where accessibility remains limited. Expanding programme coverage and enriching content with practical components, such as pelvic floor exercises and pain management techniques, may further reduce perinatal complications. From a health policy perspective, antenatal education represents a cost-effective intervention that can decrease healthcare expenditures by minimizing obstetric trauma, blood transfusion needs, and neonatal intensive care utilization.

Limitations of the study. The limitations of this study include the small sample size, its single-centre design, and the short study period, which restrict the generalizability of the findings. The lack of randomization may introduce bias, and only short-term maternal and neonatal outcomes were assessed, while long-term effects were not evaluated. Additionally, socio-economic and accessibility differences between urban and rural participants may have influenced the results.

CONCLUSIONS

The study demonstrated that participation in antenatal schools exerts multidimensional effects on pregnancy and childbirth processes. In the participant group, gestational age was longer, postpartum haemogram values were higher, and episiotomy severity was reduced. Moreover, NICU requirement was significantly decreased. Although no statistically significant differences were found in birth weight and Apgar scores, slightly higher values in the participant group suggest a possible protective trend. These findings indicate that antenatal education programmes may generate positive effects not only on psychosocial outcomes (fear of childbirth, self-efficacy, anxiety) but also on biomedical outcomes.

Based on these results, the following recommendations can be made:

- **Expansion of antenatal education.** Pregnancy School practices should be standardized at the national level, with increased accessibility particularly in rural areas.
- **Strengthening health infrastructure.** Accessibility of antenatal care services should be improved in disadvantaged regions.
- **Pelvic floor exercises and pain management.** Systematic inclusion of these practices in education programmes may reduce episiotomy rates and severity.
- **Blood loss and haemogram monitoring.** Regular follow-up should be conducted to preserve postpartum haemogram values in women attending antenatal schools.
- **Reducing NICU requirement.** Programmes should be enriched with neonatal health content, considering their potential to reduce neonatal complications.
- **Evidence-based research.** More multicentre and long-term studies are needed to clarify the effects of antenatal education on biomedical outcomes such as episiotomy severity, blood loss, and NICU requirement.

Abbreviations

- **NICU** – *Neonatal Intensive Care Unit*
- **Hb/Hct** – *Haemoglobin / Haematokrit*
- **SPSS-25** – *Statistical Package for the Social Sciences, Version 25*
- **RR** – *Relative Risk*

Ethics approval and consent to participate. Ethical approval was obtained from the Human Research Ethics Committee of the State University of Gümüşhane (Approval No. E-95674917-108.99-386536, dated 09.12.2025). Informed consent was obtained from all individual participants who were informed that voluntarily completion of the questionnaire was considered consent to participate. The study was conducted in alignment with the Declaration of Helsinki for medical research with human participants.

Acknowledgements. The authors express their thanks to Sedef DOĞAN for assistance in collecting the data for this study.

Funding. Open Access funding enabled and organized by Projekt DEAL. The authors did not receive support from any organization for the submitted work

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