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Wpływ stresu prenatalnego na rozwój motoryczny niemowląt

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Effects of prenatal stress on infant motor development

Wpływ stresu prenatalnego na rozwój motoryczny niemowląt

Martyna Franecka[1(A,B,C,D,E,F,G)], Małgorzata Domagalska-Szopa[2(D,E,F)], Andrzej Szopa[3(C,D,E,F)]

[1]Faculty of Health Sciences, University of Opole, Poland / Wydział Nauk o Zdrowiu, Uniwersytet Opolski
[2]Department of Developmental Age Physiotherapy, Medical University of Silesia, Katowice, Poland / Zakład Fizjoterapii Wieku Rozwojowego, Śląski Uniwersytet Medyczny, Katowice
[3]Department of Physiotherapy, Medical University of Silesia, Katowice, Poland / Zakład Fizjoterapii, Śląski Uniwersytet Medyczny, Katowice

Abstract

Introduction. The study aimed to investigate the correlation between prenatal maternal stress (PMS) experienced by women during pregnancy and perinatal risk factors and infant motor development, as assessed by the Alberta Infant Motor Scale (AIMS).

Aim of the study It was hypothesised that infants born to mothers who experienced PMS have lower levels of motor development during their first year of life compared to infants of mothers who did not experience PMS.

Material and methodology. The test was conducted on 171 women and their 179 children. The subjects were divided into two groups: 1) mothers who experienced PMS and 2) mothers who did not experience PMS. The same key was applied to divide the study infants into two subgroups: 1) infants of women experiencing PMS and 2) infants of women not experiencing PMS. Each infant was assessed using the standardised AIMS tool.

Results. The study results suggest that infants of mothers experiencing PMS score lower on neurodevelopmental assessments, persisting at least 12 months after birth, than infants of mothers not experiencing PMS. Moreover, a correlation was demonstrated between stress during pregnancy and factors such as gestational age, mode of delivery, birth weight, and Apgar scores.

Conclusions. Stress experienced by mothers during pregnancy can affect motor development in infancy. Also, perinatal factors such as the week and type of labour, birth weight, and Apgar score should not be underestimated.

Key words:

prenatal maternal stress, infant motor development

Streszczenie

Wprowadzenie. Badanie miało na celu ustalenie związku pomiędzy doświadczanym przez kobiety stresem w czasie ciąży (prenatal maternal stress; PMS) oraz czynnikami ryzyka okołoporodowego a rozwojem motorycznym niemowląt, ocenianym skalą Alberta Infant Motor Scale (AIMS).

Cel pracy. Postawiono hipotezę, że niemowlęta, których matki doświadczyły PMS, osiągają niższy poziom rozwoju motorycznego w pierwszym roku życia w porównaniu z niemowlętami matek, które nie doświadczyły PMS.

Materiał i metodyka. Przebadano 171 kobiet oraz 179 ich dzieci. Badane podzielono na dwie grupy: 1) matki, które doświadczały PMS oraz 2) matki, które nie doświadczały PMS. Taki sam klucz zastosowano, dzieląc badane niemowlęta na dwie podgrupy: 1) niemowlęta kobiet doświadczających PMS oraz 2) niemowlęta kobiet niedoświadczających PMS. Każde niemowlę zostało ocenione przy użyciu standaryzowanego narzędzia AIMS.

Wyniki. Wyniki badania sugerują, iż niemowlęta matek doświadczających PMS osiągają niższe wyniki w ocenie neurorozwojowej, utrzymujące się co najmniej 12 miesięcy od urodzenia niż niemowlęta matek niedoświadczających PMS. Ponadto wykazano związek pomiędzy stresem w ciąży a wiekiem ciążowym, rodzajem porodu, urodzeniową masą ciała oraz punktacją Apgar.

Wnioski. Stres doświadczany przez matki w trakcie ciąży może wpłynąć na rozwój motoryczny w okresie niemowlęcym. Nie pozostaje również bez znaczenia dla czynników okołoporodowych, takich jak tydzień i rodzaj porodu, urodzeniowa masa ciała, punktacja Apgar.

Słowa kluczowe:

stres w czasie ciąży, rozwój motoryczny niemowląt

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Introduction

The infancy period is marked by the intensive development of physical skills and the acquisition of autoregulatory and communication competencies. Several factors determine harmonious motor development in the first twelve months of life. Prenatal factors significantly impact the development of CNS structures and the potential emergence of neurodevelopmental disorders. One contributing factor is the maternal stress experienced during pregnancy. Its impact on later infant development has been frequently discussed among experts in psychology, medicine, and neuroscience. The significance of this stems from the fact that encountering stressful situations during pregnancy can yield profound implications for the child's development, encompassing physical, emotional, and cognitive aspects. Abnormalities may manifest as temporary central nervous coordination disorders or progress into conditions such as cerebral palsy, brain malformations, attention deficit hyperactivity disorder (ADHD), autism spectrum disorders (ASD), schizophrenia, and epilepsy, among other disorders. The state of constant anxiety can trigger changes in the volume of the brain's grey matter, which, in turn, is linked to neurodevelopmental disorders (NDDs), cognitive deficits, and intellectual impairment [1-3]. Moreover, changes in the structural and functional aspects of the brain caused by exposure to stress can potentially lead to emotional and cognitive challenges, subsequently impairing the capacity to manage stress, regulate emotions, acquire knowledge, make decisions [4], and even impact visual attention in later stages of life [5].

Many pregnant women experience stressful situations of various kinds. The term "stress" denotes a state in which the body reacts and experiences emotional overwhelm. It is accompanied by negative emotions, a response to events that disrupt the internal homeostasis [6]. Stress is also one of the factors that can adversely affect the developing foetus in prenatal life. Prenatal maternal stress (PMS) is a physical or psychosocial stress experienced by expectant mothers due to daily events or environmental challenges, which can impact the developing foetus [7]. According to statistical studies, the number of women experiencing a moderate level of stress during pregnancy is 78%, while 6% of women show a high level of stress. It is most often caused by adverse living conditions, professional work, marital problems, as well as a high-risk pregnancy, fear of childbirth and its complications, the health condition of the infant, and concerns about the role of the mother [8].

The COVID-19 pandemic also contributed to the mental deterioration of many people, including pregnant women. The state of uncertainty, fear, helplessness, confusion, and other emotions that arise from challenging situations can lead to neuroanatomical alterations in the mother's and child's brains [9]. According to statistical findings, close to 30% of pregnant women undergo stressful situations, anxiety, and depression in their day-to-day activities. Elevated cortisol levels and prenatal exposure to stress hormones carried through the placenta can heighten the likelihood of preterm birth (PTB), low birth weight (LBW),

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impairments in motor, mental, and cognitive development, as well as adverse effects on organogenesis, the immune system, and CNS structure [10, 11, 12].

Most authors highlight the crucial role of the mother's mental health in the child's development [13, 14, 15]. In recent years, publications have emerged that explore the link between prenatal stress and cognitive function in infants and young children [16], emotional development (irritability, anxiety, withdrawal, sleep difficulties, and self-regulation), including temperament [17], emotional and social development [18], as well as autism spectrum disorders (ASD) and attention deficit hyperactivity disorder (ADHD) [19]. Additionally, studies have shown a correlation between elevated maternal cortisol levels during the first and second trimesters of pregnancy and lower motor development parameters in infants at 6 months of age [20]. Also, the impact of prenatal stress and body mass index (BMI) in early childhood has been the subject of investigation [21]. However, there is still a lack of scholarly articles regarding the association between stress and the motor development of infants in their first year of life. Recognising the impact of risk factors and stress during pregnancy is essential for implementing early intervention and therapeutic measures that aim to minimise adverse effects on both the mother and the baby.

This thesis aims to analyse the impact of PMS on infant motor development levels, using the Alberta Infant Motor Scale (AIMS) test, and to explore the relationship between PMS and risk factors of neurodevelopmental disorders (NDDs).

The Alberta Infant Motor Scale (AIMS) is a standardised and internationally used scale for assessing gross motor development from birth to 18 months of age. It incorporates quantitative and qualitative assessments of motor skills. The children's motor skills are evaluated in a total of 58 positions, distributed as follows: 21 in the forward lying position, 9 in the backward lying position, 12 in the sitting position, and 16 in the standing position. This evaluation examines their spontaneous motor activity, encompassing posture, antigravity movements, and body orientation. The total points awarded for each of the four positions are combined to calculate an overall score, which is further translated into a centile grid chart. The principal aim of this study is to identify delays in motor development, gather information about infants' current motor development, track the progress of gross motor skills over time, and establish correlations with typical development [22, 23, 24, 25]. The timely recognition of neurodevelopmental disorders (NDDs) is associated with the potential to implement appropriate therapeutic interventions, thereby improving movement patterns and frequently leading to improved comfort and quality of life.

Aim of the study

The study aimed to provide answers to the following research questions:

1. Does the stress experienced by the mother during pregnancy affect infant motor development?
2. Does the stress experienced by the mother during pregnancy affect perinatal factors?

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The research hypothesis posited that infants born to mothers who experienced PMS would exhibit diminished levels of psychomotor development during their first year of life, as opposed to infants of non-PMS mothers. Furthermore, it was anticipated that the infants in question would achieve AIMS scale scores, classifying them at or below the 5th percentile.

Material and methodology

The study has received a favourable opinion from the Subject Panel on Ethics in Physiotherapy Research (approval no. 15/2022 of 29.06.2022). The study complies with the ethical standards outlined in the Declaration of Helsinki. Each parent was provided with detailed information about the study's objectives and willingly gave written informed consent for their infants' inclusion in the study. During the assessment, the guardian was provided reliable information about the infant's motor development level.

The study included a consecutive sample of 171 women and 179 of their infant children who met the inclusion criteria. The study's inclusion criteria encompassed children aged between 1 and 12 months and informed consent from their legal guardians. The following exclusion criteria were reported: congenital defects of the CNS, including genetic defects; diagnosed neurological disorders/diseases; acute and chronic diseases.

The characteristics of the subjects are presented in Tables 1 and 2.

Table 1. Demographic characteristics of women participating in the study

	Entire survey	Study group	Control group
n (%), SE	171	61 (36), 4	110 (64), 4
Mother's age [years]; Me, IQR, Q1–Q3	32, 5, 34–29	32, 7, 28–35	31, 5, 29–34
First pregnancy; n (%), SE%	57 (33), 4	26 (43), 6	31 (28), 4
Subsequent pregnancy; n (%), SE%	114 (67), 4	35 (57), 6	79 (72), 4
First childbirth; n (%), SE%	70 (41), 4	37 (61), 6	33 (30), 4
Another childbirth; n (%), SE%	101 (59), 4	24 (39), 6	77 (70), 4
Miscarriages; n (%), SE%	43 (25), 3	21 (34), 6	22 (20), 4
Multiple pregnancy; n (%), SE%	8 (5), 2	8 (13), 4	0 (0), 0
DASS 21 S [pts]; Me, IQR, Q1–Q3	10, 18, 6–24	26, 6, 24–30	7, 2, 6–8

Table 2. Demographic characteristics of infants participating in the study

	Entire survey	Study group	Control group
n (%), SE	179	69 (36), 4	110 (64), 4
Gestational age (hbd); Me, IQR, Q1–Q3	39, 2, 40–38	38, 1, 38–39	39, 1, 39–40
Birth weight (g); Me, IQR, Q1–Q3	3354, 555, 3110–3665	3180, 680, 2800–3480	3495, 515, 3265–3780
APGAR in 5 min.; Me, IQR, Q1–Q3	10, 0, 10–10	10, 1, 9–10	10, 0, 10–10
/ Natural childbirth; n (%), SE%	81 (45), 4	15 (22), 5	66 (60), 5
Caesarean section delivery; n (%), SE%	98 (55), 4	54 (78), 5	44 (40), 5

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	Entire survey	Study group	Control group
Sex of infants			
male; n (%), SE	93 (52), 4	30 (43), 6	66 (60), 5
female; n (%), SE	86 (48), 4	39 (57), 6	44 (40), 5
AIMS infant percentile			
≤ 5th percentile, n (%), SE	51 (28), 3	35 (51), 6	16 (15), 3
> 5th percentile, n (%), SE	128 (72), 3	34 (49), 6	94 (85), 3

DASS-21-S (Stress) subscale test was performed on each subject [26, 27, 28]. The DASS-21 is a set of 3 scales: depression, anxiety and stress, designed for self-monitoring and self-assessment. The questionnaire consists of 21 questions, 7 for each scale. The Stress Scale assesses difficulty in relaxation, nervous agitation and ease of nervousness/agitation, irritability / over-reactivity and impatience. One can score between 0 and 42 points. According to the standardisation, a score of 15 points and above indicates that the subject was experiencing stress [29].
Based on the number of DASS-21-S scores, the subjects were divided into two groups: the study group, mothers who experienced PMS and the control group, mothers who did not experience PMS (Table 1). The study infants were divided into two subgroups using the same key: the study group, which comprised infants of women experiencing PMS, and the control group, which included infants of women not experiencing PMS (Table 2).
Each infant was assessed meticulously for spontaneous motor skills and developmentally age-appropriate skills using the Alberta Infant Motor Scale (AIMS). Corrected age was taken into account for infants born before 37 weeks of pregnancy (HBD). All infants were assessed in pronated, supinated, sitting and standing positions, taking into account the "developmental window" of current skills.

Statistical analysis

The data was entered into a database created in an MS Excel 2019 spreadsheet. Statistical analyses were conducted utilising StatSoft Statistica 12.5 software to validate the research hypotheses. The Shapiro-Wilk and Kolmogorov-Smirnov tests were employed to examine the distribution of the variables. The variables do not have a normal distribution. Median, range, IQR, and Q1-Q3 were used to present descriptive statistics for perinatal factors and demographic characteristics, while the mean was used for AIMS scores. Proportions have been supplemented with a standard error of proportion. Further, non-parametric χ^2 tests were applied. All results were considered significant at $p < 0.05$. Sample power was assessed using Gpower 3.1 software. Post-hoc calculations using the given parameters $w = 0.5$, $\alpha = 0.05$, $Df = 1$, yielded a sample power of $(1 - \beta) = 0.99$.

Results of the study

Of the 171 mothers surveyed, 39% (n = 61, SE = 4%) reported experiencing heightened stress levels. This stress was primarily linked to factors such as being at risk during pregnancy, having

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multiple pregnancies, concerns about the infants' health during and after birth, worries about the delivery process, and uncertainty related to the COVID-19 pandemic. Some mothers reported a difficult financial and marital situation.
Out of the 179 infants investigated, 28% (n = 51, SE = 3%) achieved a score classifying them at or below the 5th percentile according to the AIMS scale (fig. 1).

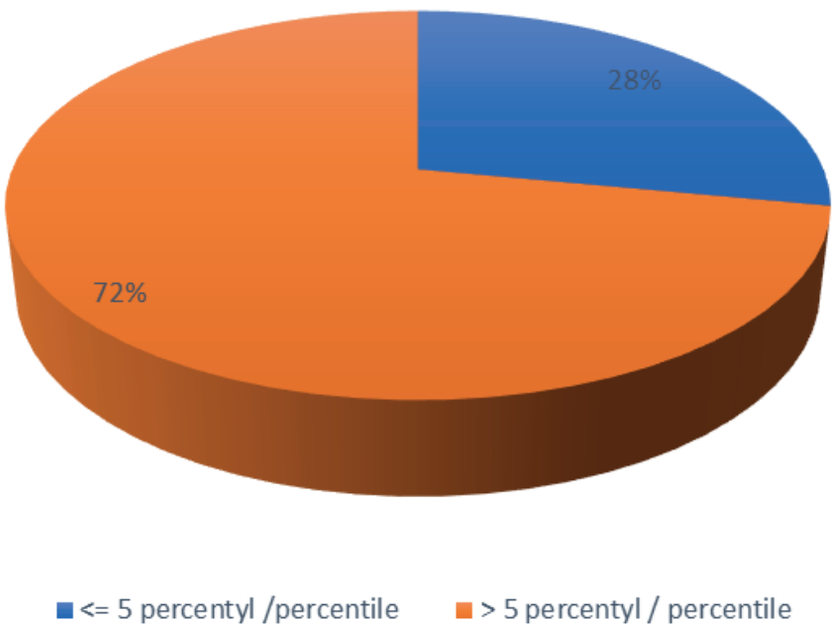

Figure 1. An overall breakdown of the motor skill level of the infants qualified for participation in the study

Of the 69 infants examined in the study group, 51% (n = 35, SE = 6%) recorded a score at or below the 5th percentile according to the AIMS scale.
The χ^2 test was employed to examine the relationship between stress experienced during pregnancy and the number of infants classified at or below the 5th percentile according to the AIMS scale (table 3).

Table 3. Distribution of infants' motor skills levels in the two study groups

	≤ 5 percentyle	> 5 percentyle	SE
Study group	51% (35)	49% (34)	6%
Control group	15% (16)	85% (94)	3%

The result of the χ^2 test (1, n = 179) = 34.72 indicates a significant relationship between the two factors, and the p-value < 0.00001 indicates a significant statistical relationship.
Figure 2 shows a breakdown of the mean AIMS scores obtained by month.

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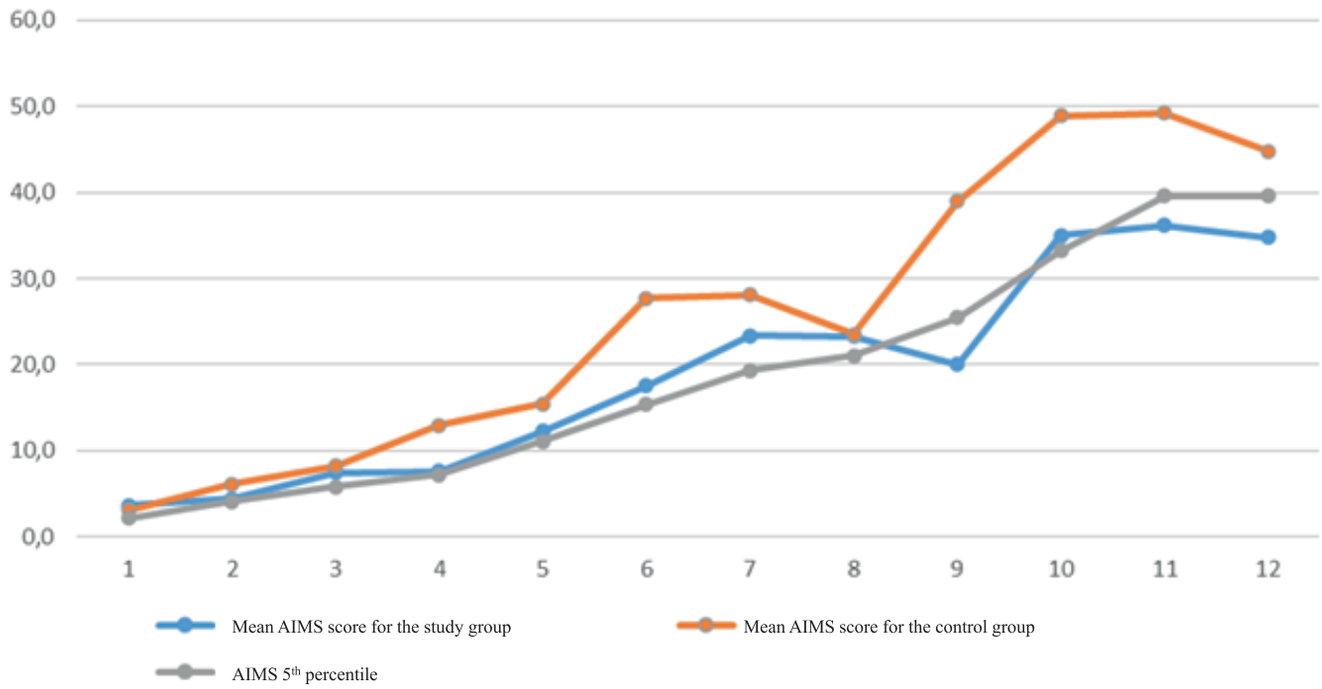

Figure 2. Mean AIMS scores in relation to the 5th percentile chart by month

Table 4. Levels of infant motor skills in the two study groups by month

Age [months]	Study group						Control group					
	Number of children	AIMS mean: overall	pronation position	supination position	sitting position	standing position	Number of children	AIMS mean: overall	pronation position	supination position	sitting position	standing position
1	6	3.7	1.2	0.7	0.0	1.8	9	3.1	1.2	0.8	0.0	1.1
2	7	4.4	1.9	1.4	0.0	1.1	10	6.1	2.3	2.4	0.0	1.4
3	7	7.4	2.7	2.9	0.0	1.9	8	8.3	3.8	3.5	0.0	1.0
4	8	7.6	3.0	3.1	0.0	1.5	13	12.9	5.4	4.6	1.5	1.5
5	9	12.2	6.4	4.0	0.8	1.0	11	15.5	7.0	5.1	1.5	1.8
6	7	17.6	8.0	5.6	2.1	1.9	10	27.7	12.5	8.2	4.6	2.4
7	3	23.3	10.7	7.7	3.0	2.0	11	28.1	12.7	8.5	4.8	2.1
8	8	23.3	11.5	7.6	2.4	1.8	4	23.5	10.5	7.8	2.8	2.5
9	3	20.0	9.3	6.7	3.0	1.0	7	39.0	17.1	9.0	8.1	4.7
10	2	35.0	20.0	9.0	5.0	1.0	10	48.9	20.8	9.0	11.8	7.3
11	5	36.2	17.2	9.0	7.6	2.4	8	49.3	21.0	9.0	12.0	7.3
12	4	34.8	17.5	8.3	6.8	2.3	9	44.8	19.4	8.9	10.7	5.8

The findings of the analysis of the infant study in the first year of life indicated that infants of mothers who experienced stress during pregnancy score lower on the neurodevelopmental assessment (Table 4, Fig. 2). These

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persist for at least 12 months after birth. During the initial month of life, infants in both groups exhibit a comparable level of development, potentially attributed to their limited motor skills during this period. The disparity becomes apparent in subsequent months, as infants from no-stress pregnancies develop individual motor skills significantly faster.

Analysing the mean scores of the infants' motor skills test in both groups by month, it is evident that the mean score for each of the 4 positions and the total AIMS mean exhibit close similarity in the initial month of life. In consecutive months, infants born to mothers who were not exposed to stress during pregnancy achieve higher scores. During the second month of life, infants born to mothers who experienced stress during pregnancy have an average score of 4.4 points, whereas infants born to mothers who did not experience stress have a score of 6.1 points. The difference between the study groups was 1.7 points. Over the subsequent months, the disparity increases, culminating at 9 months of age with a maximum discrepancy of 19 points between the experimental groups.

The mean scores achieved by the infants in each position in the two study groups indicate differences in acquiring new motor skills. During the fifth and sixth months, infants of mothers who are not experiencing stress demonstrate faster motor development in the pronated position. In comparison, infants in the other study group exhibit slower acquisition of new skills but eventually catch up to their non-stressed counterparts by the age of 8 months. From 9 months onwards, Infants in both groups show similar developmental progress, but those infants not stressed during pregnancy acquire new skills one month earlier. In the supine position, infants from stressed pregnancies show a one-month delay in the acquisition of new skills compared to infants in the control group. Infants in both groups do not achieve similar results until 10 months of age. Similar results are observed in the sitting position. The delay of 1 month in acquiring new motor skills persists until 8 months of age. From the 9th month onwards, infants with non-stressed mothers display accelerated development, resulting in a growing developmental gap between the two groups. The difference in scores between the infants in the two groups is 5.1 points at 9 months and 6.8 points at 10 months. By 12 months, infants exposed to prenatal stress score lower than their peers, averaging 6.8 points compared to 10.7 points for infants not subjected to stress. In the standing position, the mean AIMS scores for infants up to 9 months of age were similar in both groups. Following this period, infants born to mothers who did not experience prenatal stress commenced acquiring new motor skills, whereas infants in the study group did not exhibit these skills until the end of the study period.

Analysis of the impact of stress during pregnancy on selected perinatal factors, such as gestational age (HBD), type of delivery, birth weight (BW), and Apgar score at 5 minutes, showed significant correlations between the study groups (Table 5).

A series of χ^2 tests were used to assess the impact of prenatal stress on selected perinatal factors. The correlation between stress experienced during pregnancy

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Table 5. Impact of stress on perinatal factors

	Entire survey	Study group
Gestational age (HBD) % (n), SE		
Babies born at or before the 36th week of pregnancy	19% (13), 5%	1% (1), 1%
Babies born after the 36th week of pregnancy	81% (56), 5%	99% (109), 1%
Birth weight (UMC) % (n), SE		
Babies with a birth weight of 3,000 g or less	36% (25), 6%	5% (6), 2%
Babies with a birth weight over 3,000 g	64% (44), 6%	95% (104), 2%
Apgar score % (n), SE		
Babies with an Apgar score of less than 10	30% (21), 6%	11% (12), 3%
Babies with an Apgar score of 10	70% (48), 6%	89% (98), 3%
Type of birth (CC / SN) % (n), SE		
Delivery by caesarean section (CC)	78% (54), 5%	40% (44), 5%
Natural childbirth (SN)	22% (15), 5%	60% (66), 5%

and the number of infants born at 36 HBD and under was investigated. The result of the χ^2 test (1, n = 179) = 18.91 indicates a significant connection between the two factors, and the p-value < 0.000014 indicates a significant statistical relationship. Among women experiencing stress during pregnancy, a substantial proportion of births tend to occur before the 37th HBD, comprising approximately 19% of births in the study cohort. One such case was reported in the control group. Additionally, an investigation was conducted to assess the correlation between stress encountered during pregnancy and the number of infants with a birth weight (BW) of 3,000 g and below. The two factors were found to be significantly correlated (χ^2 (1, n = 179) = 28.05) and statistically significant (p < 0.00001). Mothers who encounter stress during pregnancy are more likely to deliver babies with birth weights of 3,000 g and below. The percentage is 36% in the study group, and in the control group, it is 5%. The result of the correlation between stress encountered during pregnancy and the number of infants with an Apgar score below 10 at the 5th-minute mark (χ^2 (1, n = 179) = 10.7508) validates the relationship between the two factors. The p-value = 0.001042 has a significant statistical correlation. Infants of mothers stressed during pregnancy are more likely to receive an Apgar score of less than 10 points at 5 minutes of life. In the study group, the percentage is 30%. In the control group, 11%.

Discussion

The impact of stress on human health is a matter of great scientific interest and investigation. As per Selye's theory [30], stress is the unique response of an organism to any factors that disrupt the physiological balance. The impact of high-stress levels during pregnancy on the birth and developmental parameters of infants should not be underestimated. The studies conducted by Hoffman et al. [31] and Walsh et al. [9] have indicated that it has the potential to expedite delivery by an average of 1.3 weeks.

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This poses a significant danger as infants born prematurely face an increased likelihood of severe neurodevelopmental disorders, such as cerebral palsy [32]. The stress experienced by the mother can also affect the weight at birth. The current study established a statistically significant relationship between stress and birth weight of 3000 g and below. In their respective studies, Schetter et al. [10] and Mélançon et al. [33] confirm that chronic stress is a significant risk factor for low birth weight (LBW). Additionally, Mantoya-Williams et al. [34] provide evidence supporting the association between low birth weight and NR3C1 genes, which are directly involved in stress responses.

Most researchers primarily focus on the link between stress during pregnancy and the increased likelihood of premature delivery and significantly reduced birth weight. The results of the study showed that these problems also appear in the form of reduced Apgar scores (30% of infants scored below 10, SE = 6% compared to 11% among infants of mothers not experiencing stress, SE = 3%), χ^2 (1, n = 179) = 10.7508, p = 0.001042 and birth by caesarean section (78% of pregnancies among women experiencing stress during pregnancy, SE = 5% compared to 40% among women not experiencing stress during pregnancy, SE = 5%); χ^2 (1, n = 179) = 19.672, p < 0.00001.

As reported by other authors [35, 36], heightened stress levels during pregnancy can potentially affect the delay of various developmental areas in early childhood, including the development of gross motor skills. Parsa et al. [37] present an alternative perspective, as they conducted a study involving 300 depressed mothers and their infants and found no significant correlation between maternal depressive states and developmental disorders in infants at approximately 12 months old. Polanska et al. [38] conducted a study that revealed similar results. Nevertheless, the authors acknowledged that the research mainly focused on cognitive development beyond 12 months. Schiavo et al. [39] conducted a study that examined the influence of depression on infant development at 6 and 14 months. Despite the study's main focus being on cognitive-social skills, it showed a correlation with delays in gross motor skills. Severo et al. [40] referred to the risk of developmental delays associated with depression in pregnant women. Moreover, studies conducted on infants' cognitive, language, and motor development, evaluated using the Bayley scale until approximately 13 months old, support the correlation between prenatal stress and lower motor development scores in the study group [41, 42].

Infants born to women who have experienced PMS tend to score lower on neurodevelopmental assessments and have a significantly increased likelihood of requiring therapeutic support. This condition persists until the child reaches at least 12 months of age. This finding is backed by a study conducted by Tuovinen et al. [43], which demonstrated a correlation between the level of depression in pregnant women and diminished development in various domains, such as gross and fine motor skills, communication, and interpersonal skills. Based on a recent study by Zhang et al. [44], it appears that pregnant women's depression and associated heightened stress levels may have a detrimental effect on early infant neurological development.

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The central focus in most studies investigating the relationship between depression, anxiety, and stress in pregnant women and their impact on child development revolves around the assessment of cognitive function, emotional function, large and small motor skills, and communication after the age of 12 months. The present study directed its attention towards the motor skills of infants within the age range of 0 to 12 months. As per the AIMS standardisation, infants were observed in four primary areas of functioning – prone, supine, sitting, and standing. This assessment delivered a quantifiable outcome on gross motor development, which was subsequently converted into a centile grid relative to population norms. Careful observation of spontaneous motor skills and movement quality formed the basis for analysing the areas mentioned above, thereby indicating the infants' level of development. The study's results highlighted that infants of mothers who experience PMS exhibit noticeable delays in reaching expected skills from the 4th month onwards. The centile grid shows that these infants' overall score places them at or below the 5th percentile. Nafei et al. [13] obtained comparable results in their research on the impact of prenatal stress on infant development at 6 months.

Summary

Stress experienced by pregnant women can have detrimental effects on the physical development of infants. This study aimed to investigate the relationship between stress experienced during pregnancy and the development of motor skills in infants, while also exploring the impact of prenatal stress on specific perinatal factors. 171 women and 179 of their children were involved in the study. The AIMS scale was employed to evaluate the children's motor development. Two initial hypotheses were validated. Based on the findings, it can be concluded that stress experienced during pregnancy impacts the motor development of infants for a minimum duration of 12 months. Moreover, the psychological and physical state of the mother during pregnancy should not be overlooked, as it influences certain perinatal factors, including prematurity, lower birth weight, and the Apgar score at 5 minutes post-birth.

Further research is needed to fully understand the complex and multidimensional issue of how stress experienced by pregnant women affects infant development. Increasing evidence suggests that the occurrence of stress, anxiety, and distress during pregnancy can lead to adverse health outcomes, both in infancy and beyond.

Stress is an inherent component of life and cannot be eradicated entirely. What is of utmost importance in this context is the utilisation of appropriate stress management strategies, the availability of social and emotional support, and the provision of adequate medical care, all of which can effectively reduce the detrimental effects on health.

Conclusions

1. The provision of sufficient psycho-physiological support to pregnant women seems to be a crucial factor in reducing prenatal stress levels and promoting better acquisition of infant motor skills.
2. Additional research is required to comprehend the intricate impacts of stress on infants' development and devise efficacious intervention strategies.

Adres do korespondencji / Corresponding author

Martyna Franecka

e-mail: martyna.franecka@uni.opole.pl

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Piśmiennictwo/ References

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