Urinary Incontinence in Pregnancy and after Childbirth

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Abstract:

Introduction: The development of incontinence depends on many factors and more often affects women who have already given birth. It is related to the growth of the fetus and the pressure of the head and fetus on the bladder and pelvic floor muscles. Hormonal influences also play an important role, as they relax the muscles and also affect the pelvic ligament. Due to this fact, in the research, we investigated urinary incontinence in a selected research sample and determined the degree of connection between incontinence of the respondents and factors such as pregnancy, number of births and the method of delivery. **Methods**: Using Microsoft Excel, we performed a mathematical-statistical evaluation of the data, which we expressed as a percentage in the attached graphic and tabular processing. We verified the hypotheses with the correlation coefficient, the Spearman coefficient and the non-parametric Kruskal-Wallis test. We made the decision about the existence of statistical sig-

nificance based on the calculated p value and the significance level of 0.05.

Results: By processing the results, we pointed out the degree of connection of urinary incontinence with several factors, namely pregnancy, the method of delivery and the number of births. For stress and overflow incontinence, the differences between the groups are very small. In urge incontinence, the differences are more pronounced between means and the mean ranks. However, even here, significant difference between the groups was not confirmed. Also, the connection between the number of births and urinary incontinence was not confirmed. However, we found a connection between the method of delivery and overflow and urge incontinence.

Conclusion: Urinary incontinence during pregnancy and after childbirth is a significant burden for a woman. It covers the issues of the women it concerns in all spheres of life. Urinary incontinence is a certain burden for the whole society, not only for the affected woman. Therefore, one cannot forget exact drug therapy and other conservative treatment procedures, including the often underappreciated special therapeutic gymnastics – pelvic floor strengthening.

Introduction

Loss of the ability to hold urine is one of the most common health problems, especially in women. It is not associated with high morbidity or mortality, but it has a fundamental impact on the quality of life of affected persons. Even though incontinence is not a disease in the true sense of the word, but only a symptom of some disease states, it has a negative impact on affected persons and their quality of life.

Women do not mind talking about their illness, menstruation, childbirth, but they consider talking about urinary incontinence humiliating, something to be ashamed of. For most women, the topic of urinary incontinence is a taboo subject not to be discussed. Women who develop incontinence do not want to admit their condition, they consider leakage of urine to be only rare accidents, or they are aware of the seriousness of the problem, but do not have the courage to seek medical help and talk about it. In order to prevent women's social isolation and more serious health damage, it is necessary to pay more attention to the issue of female incontinence from the healthcare sector, especially by educating women of all ages, from their youngest age to their senior age. Lack of information among women about the prevention, diagnosis and treatment of urinary incontinence results in an increasing number of women affected by it. In pregnant women, urinary incontinence is encountered quite often, the frequency is reported in up to half of the women. The development of incontinence depends on many factors and more often affects women who have already given birth. It is related to the growth of the fetus and the pressure of the head and fetus on the bladder and pelvic floor muscles. Hormonal influences also play an important role, as they relax the muscles and also affect the pelvic ligament. Treatment and prevention of urine leakage during pregnancy is based on strengthening the structures of the pelvic floor.

Factors affecting incontinence in pregnant women

Pregnancy - One third of pregnant women suffer from incontinence during pregnancy. Incontinence itself usually occurs after the 36th week of pregnancy, or there are the greatest number of cases reported in women in whom leakage of urine occurs in that period.

According to the trimesters, physiological changes in the area of the lower urinary tract are as follows:

- 1st trimester: reduced bladder capacity (approx. to a volume of 410 ml), frequent urinating even at night (once or more often);

- 2nd trimester: increase in bladder capacity up to 460 ml, nocturnal urination is on decline thanks to the displacement of uterus higher in the small pelvis, thus freeing up space for the bladder;
- 3rd trimester: bladder capacity limited to approx. 270 ml due to the pressure of the fetal head, irritation of the nerve endings in the small pelvis, polyuria as a result of reduced volume capacity of the bladder (1).Due to the increase in intra-abdominal pressure and the growing uterus, blood flow and the passage of nerve signals to the bladder worsen.

The impact of the labor management - The aim of most studies is to evaluate the prevalence of urinary incontinence depending on the method of delivery, i.e. whether it was ended vaginally or by caesarean section. An important factor affecting the damage to the pelvic floor is the way of delivery management and the associated development of pelvic organ prolapse and stress incontinence.

- Damage to the pelvic floor can be caused by injury to nerves, muscles or fascia and other supporting structures of the small pelvis (2). The ability of the pelvic floor to support the preservation of urinary incontinence is undoubtedly threatened by the processes of ***vaginal delivery***. At the moment when the head appears in the vaginal entrance, the muscles, fascia and nerves of the pelvic floor are stretched by the widest part of baby's head and the maximum opening of the pelvic floor occurs. It is obvious that tension and possible tearing of the intrapelvic fascia and muscles together with damage to the pudendal nerves can cause pelvic floor dysfunction. Subsequent fascial tears are able to heal, but the resulting connective tissue is thought to be not as strong as the original, and the woman therefore suffers from pelvic floor symptoms that manifest as incontinence or pelvic organ prolapse. A recent study led by Krofta (2015) also confirms the results pointing to the negative benefit of a higher age limit depending on the incidence of urinary incontinence. It showed that women older than 35 years had significantly higher incidence of urinary incontinence 12 months after vaginal delivery. The main emphasis was placed on the age of the woman at first birth (3).
- In 2016, Tähtinen conducted an extensive meta-analysis, where he compared the results of 15 foreign studies that showed the risk of stress and urge urinary incontinence in a comparison of spontaneous vaginal delivery versus ***caesarean section*** one year after delivery. The result was a demonstrably higher incidence of mainly stress incontinence; to a lesser extent urge incontinence, almost twice as much in favor of vaginal delivery. Four studies showed no difference; 8 studies showed a greater risk of developing long-term stress incontinence after delivery (37%), with caesarean section (2.6%). Furthermore, it was confirmed that the incidence of urinary incontinence with greatest increase mainly affected younger women (4).

The prevalence of stress urinary incontinence during pregnancy ranges from 8% to 85%, but usually resolves after delivery. Childbirth can weaken or damage the structures of the pelvic floor and the innervation of the sphincter mechanism of the urethra. The conclusions of many studies support the association of increased risk of incontinence in women who have given birth frequently (4 or more births) (5).

Prevalence of urinary incontinence in pregnancy

The prevalence of urinary incontinence in pregnancy is unexpectedly high. A large questionnaire study by the *Norwegian Institute of Public Health* found that the most common type of urinary incontinence is stress incontinence, with a high incidence in both primigravida 31% and multigravida 42% (6). These are very serious numbers, also confirmed by the subsequent study of Morkved & Bo. It also showed that 8 weeks after giving birth, 38% of women still suffered from stress incontinence. Other European studies from Great Britain, Spain, Scotland, Germany and Denmark report the prevalence of urinary incontinence in pregnancy very similarly (7). The data are also confirmed by studies from other continents, with a higher incidence in countries with greater demands on the quality of life. An extensive Chinese study reports figures slightly lower than European ones, on the contrary, studies from the USA report the highest prevalence, Thomason 60% SUI and Raza-Khan even 70% in primiparous and 75% in multiparous, with 32% incidence of pure stress urinary inconti-

nence. The Australian results practically copy the American ones - Chiarelli & Campbell 64% (8), Brown's more recent study then 36.9% stress urinary incontinence, 13.1% mixed; 5.9% urge incontinence. Although the prevalence of incontinence varies slightly according to the country of origin, study design and sample size, practically all the authors agree that it clearly increases with gestational age, with a maximum in the 3rd trimester or after the 36th week of pregnancy. In the 1st trimester, the incidence of incontinence is reported to be 13-19%; in the second around 19-20%; with a significant increase in the 3rd trimester up to 37.5% and more. According to the type of incontinence, stress incontinence prevails with an incidence of 18.6-60%, urge incontinence varies from 2% to 35%; mixed incontinence between 3.8-13.1% (9).

Research objectives

- To determine whether pregnancy has an effect on urinary incontinence
- To verify the association between the number of births and urinary incontinence
- To map the connection between the way of delivery management and urinary incontinence

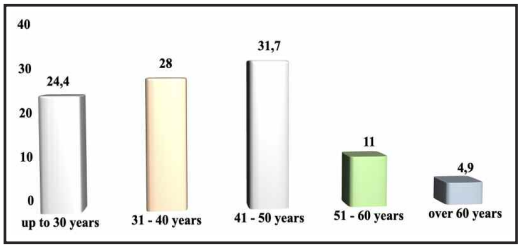
Data analysis methods

The research group was made up of various women, be it nurses, auxiliary medical staff and, of course, patients. Using the Microsoft Excel, we performed a mathematical-statistical evaluation of the data, which we expressed as a percentage in the attached graphic and tabular processing. We verified the hypotheses with the correlation coefficient, the Spearman coefficient and the non-parametric Kruskal-Wallis test. We made the decision about the existence of statistical significance based on the calculated p value and the significance level of 0.05.

Demographic data

The first monitored demographic data for the respondents was their age. The average age of female respondents was 40.37 years; the oldest respondent was 70 years old; the youngest was 19 years old. 24.4% (20) female respondents were from the age group under 30; in the age category from 31 to 40 years, there were 23 (28%) women. There were 9 (11%) female respondents aged 51-60. The most numerous age group consisted of female respondents in the age category from 41 to 50, in this age there were 26 (31.7%) women. The least represented were women aged 60 and over, there were only 4 of them and made up 4.9% of the research sample. Detailed data are shown in Graph 1.

Graph 1 Age of respondents



In our research, we determined the degree of stress, urge and overflow incontinence through the relevant items. According to our research, *stress incontinence* affects 79.3% of respondents. Another type of incontinence is *urge incontinence*. We asked the respondents how often they feel a sudden and intense urge to urinate, which is a typical symptom of this type of incontinence. Almost half of the respondents (48.8%) admitted that this happens to them very rarely. More often it happens to 18.3% of interviewed women and very often to 7.3% of female respondents. Another type of incontinence is *leakage of urine when the bladder is full*, also called *overflow incontinence* in professional literature. 34.1% of interviewed women do not have this problem at all. Exactly half of the respondents experience it only very rarely. At the same time, 40.2% of women said that in such situations they only leak a few drops, and 9.8% of women leak an average amount of urine. More often, 12.2% of women leak urine with a full bladder; 3.7% of them state that in these situations it is only drops; in 6.1% of the women the amount is medium; in 2.4% of the respondents the amount is more than 30 ml. The other 3.7% of asked women always have a problem with overflow when their bladder is full. 1.2% of them leak a moderate amount; 2.4% of these women leak a lot of urine - over 30 ml.

Table 1 Stress, urge and overflow incontinence

Stress incontinence			urge incontinence			overflow incontinence Frequency quantity	none	Very little, drops	Medium to 30 ml	A lot, more than 30 ml
none	17	20.70%	Never	21	25.60%	Never	34,10%			
1st degree	26	31.70%	Very rarely	40	48.80%	Very rarely		40.2 %	9.80%	
2nd degree	29	35.40%	More often	15	18.30%	More often		3.70%	6.10%	2.40%
3rd degree	10	12.20%	Very often	6	7.30%	Always			1.20%	2.40%

When asked if they were currently pregnant, 12.2% of the interviewed women gave positive answer; 80.5% answered negatively. The other 7.3% chose the answer *I don't know*, *I'm not sure*. Those who answered that they were pregnant also stated the week of pregnancy. It ranged from the 5th to the 41st week.

Table 2 Current pregnancy

Current pregnancy	n	%
Yes	10	12.2
No	66	80.5
I don't know, I'm not sure	6	7.3
Total	82	100

In addition to the current pregnancy, we determined the number of previous pregnancies in the next item of the questionnaire (Table 3). Before now, 20.7% of the interviewed women were never pregnant; 28.0% of the women were pregnant once; 23.2% of the women twice; 18.3% three times. Multiple pregnancies occurred rarely. 6.1% of the interviewed women had been pregnant 4 times. 5, 6 or 8 pregnancies were reported by only one woman for each, i.e. 1.2% of the research group.

Table 3 Number of pregnancies

Number of pregnancies so far	n	%
none	17	20.7
1	23	28.0
2	19	23.2
3	15	18.3
4	5	6.1
5	1	1.2
6	1	1.2
8	1	1.2
total	82	100

In the next item of the questionnaire, the respondents were to indicate the number of births. The same 20.7% of respondents said they had never given birth; 29.3% of respondents gave birth once; 25.6% of respondents twice; 17.1% of respondents had given birth 3 times. 4.9% of respondents had given birth 4 times and 2.4% of respondents 6 times. (Table 4)

Table 4 Number of births

Number of births	n	%
none	17	20.7
1	24	29.3
2	21	25.6
3	14	17.1
4	4	4.9
6	2	2.4
total	82	100

In the next item of the questionnaire, we asked how much time had passed since the last birth. 25.6% of respondents gave birth 1 to 5 years ago; 17.1% of respondents6 to 10 years ago. Likewise, 17.1% of female respondents gave birth 11 - 15 years ago; 6.1% of respondents gave birth 16 - 20 years ago; 13.4% of respondents more than 20 years ago. The above-mentioned 20.7% of female respondents have not yet given birth.

Table 5 Last childbirth

Last childbirth	n	%
1-5years ago	21	25.6
6-10years ago	14	17.1
11-15years ago	14	17.1
16-20 years ago	5	6.1
more than 20 years ago	11	13.4
never	17	20.7
total	82	100

The way of delivery management can also have an impact on problems with urine leakage. Therefore, we investigated this fact as well. Of the 65 interviewed women who had given birth in the past, 15.4% had their last vaginal birth induced by medication; 53.8% of respondents gave birth naturally vaginally; 24.6% of respondents gave birth by caesarean section; 6.2% of respondents gave last birth by forceps.

Table 6 Way of delivery management

Delivery management	n	%
vaginal– induced	10	15,
vaginal– natural	35	53.8
caesarean section	16	24.6
forceps delivery	4	6.2
total	65	100

Hypotheses verification

Hypothesis 1: We assume that there is a statistically significant relationship between pregnancy and urinary incontinence.

In the first hypothesis, we verified and compared the rate of stress, urge, and overflow incontinence in two groups of women. One consisted of 10 women who are currently pregnant. The second group consisted of 66 women who answered that they were currently not pregnant. We used the Mann-Whitney test for verification. Table 7 shows the results. In *stress incontinence*, the differences between the groups are very small. In the group of pregnant women, the mean is 1.40. In the group of other women, the mean grade is 1.45. The corresponding p-value of 0.848 is very high, well above all common significance levels. There is no significant difference between the groups. It is the same with *overflow incontinence*. The mean in the group of pregnant women is 1.00. In the second group, the mean is 0.91. However, the p-value of 0.768 is again very high and confirms the non-significance of differences between the groups. In *stress incontinence*, the differences between the groups are very small. It is very similar with *overflow incontinence*. In case of *urge incontinence*, we already see significant differences between means and mean ranks. In the group of pregnant respondents, the mean is 1.50, in the other group it is 1.02. However, even here the p-value of 0.204 is above conventional significance levels. This is probably mainly because the group of pregnant women is relatively small and very inhomogeneous. Even here, the significant difference between the groups was not confirmed. Hypothesis 1 was not confirmed. According to our findings, none of the examined types of incontinence is related to pregnancy.

Table 7 Comparison of incontinence by pregnancy

Ranks

	Pregnancy	N	Mean	Mean Rank
Stress incontinence	no	66	1.45	39.70
	yes	10	1.40	38.32
	Total	76		
Overflow incontinence	no	66	0.91	38.23
	yes	10	1.00	40.30
	Total	76		
Urge incontinence	no	66	1.02	3733
	yes	10	1.50	4620
	Total	76		

Test Statistics

	Stress incontinence	Overflow incontinence	Urge incontinence
Mann-WhitneyU	318,000	312,000	253,000
WilcoxonW	1527,000	2523,000	2464,000
Z	-,192	-,295	-1,269
Asymp. Sig. (2-tailed)	,848	,768	,204

Hypothesis 2: We assume that there is a statistically significant relationship between the number of births and urinary incontinence.

In the second hypothesis, we will again verify all three investigated types of incontinence depending on the number of births. Since we examined both variables with an ordinal variable, we will use the Spearmann coefficient again. The correlation coefficient between the number of births and stress incontinence is 0.179. The value expresses a direct connection, but a very weak one; and according to the p-value of 0.154 statistically insignificant. The correlation coefficient is even lower for the second type of incontinence. The value of 0.030 expresses only a trivial connection of the variables and the p-value of 0.789 confirms that it is also insignificant. The correlation coefficient -0.135 for urge incontinence is even negative. It indicates an indirect relationship. Thus, as the number of births increases, this type of incontinence decreases. However, the value is close to zero, so the connection is again only trivial and statistically insignificant, as the p-value is 0.228. Hypothesis 2 was not confirmed. None of the examined types of incontinence is related to the number of births.

Hypothesis 3: We assume that there is a statistically significant association between the way of labor management and urinary incontinence.

The aim of the last hypothesis is to compare incontinence in groups of women who gave birth in different ways. From our sample, 66 interviewed women gave birth, which we divided into 4 groups according to the method of delivery. The first group consisted of 10 women after in-

Table 8 Correlation between number of births and incontinence

Correlations			**number of births**
Spearman's rho	Stress incontinence	Correlation Coefficient	179
		Sig.(2-tailed)	154
		N	65
	Overflow incontinence	Correlation Coefficient	030
		Sig.(2-tailed)	789
		N	82
	Urge incontinence	Correlation Coeffcient	-135
		Sig.(2-tailed)	228
		N	82

duced vaginal birth. The second group consisted of 36 women after a natural vaginal birth. The third group of women consisted of 16 women after caesarean section, and the last group included only 4 women (the least numerous group) who experienced forceps delivery. Any differences between these groups were determined by means of the non-parametric Kruskal-Wallis test. In the table we can see that the means in the groups are different for stress incontinence. The lowest mean rate of incontinence is in the group of women after caesarean section (1.13). In both groups, the average is higher after vaginal delivery (1.50 and 1.67). The highest average (2.50), i.e. generally the greatest degree of stress incontinence, is experienced by women after a forceps delivery. However, the corresponding p-value of the test of 0.102 is higher than normal significance levels. Therefore, we cannot consider these differences between groups to be statistically significant. With the second type of incontinence – overflow – the differences are even more pronounced. Here, too, the mean is the lowest in the group of women after caesarean section (0.50). It is slightly higher in both groups of women who gave birth vaginally (1.00). The highest mean (2.75) is in the group of women who had a forceps delivery. For this type of incontinence, the p-value is 0.001. As it is lower than the significance level, we therefore consider the differences between the groups to be statistically significant. In urge incontinence, we find similar trends as in the first two types. The lowest mean is in the group of women after caesarean section (0.69). For induced vaginal birth, it is almost the same (0.70). It is slightly higher in the group of women after a natural vaginal birth (1.11) and the highest, again, among women after a forceps birth (2.00). A p-value of 0.036 below the significance level again confirms the statistical significance of these differences.

Table 9 Comparison of incontinence by method of delivery

Stress incontinence	Vaginal - natural	36	1.67	29.34
	Caesarean section	16	1.13	21.64
	Forceps delivery	4	2.50	36.50
	Total	53		
Overflow incontinence	Vaginal - induced	10	1.00	33.60
	Vaginal - natural	36	1.00	34.93
	Caesarean section	16	0.50	23.06
	Forceps delivery	4	2.75	62.13
	Total	66		
Urge incontinence	Vaginal - induced	10	0.70	26.80
	Vaginal - natural	36	1.11	36.67
	Caesarean section	16	0.69	26.44
	Forceps delivery	4	2.00	50.00
	Total	66		

Test Statistics

	Stress incontinence	Overflow incontinence	Urge incontinence
Kruskal-Wallis H	6.201	15.888	8.546
df	3	3	3
Asymp.Sig.	102	001	036

Hypothesis 3 was confirmed for overflow incontinence and urge incontinence. Both types of incontinence are related to the way of delivery management. The impact on stress incontinence was apparently not confirmed mainly due to the low number of women after a forceps birth.

Discussion

Urinary incontinence is a significant burden for a woman. It covers the issues of the women in all spheres of life. Urinary incontinence is a certain burden for the whole society, not only for the affected woman. Because of this, we investigated whether pregnancy has an effect on urinary incontinence. We also verified the association between the number of births and urinary incontinence and between the method of delivery and urinary incontinence. The research group was made up of various women, be it nurses, auxiliary medical staff and, of course, patients. The average age of female respondents was 40.37 years. The oldest respondent was 70 years old; the youngest was 19 years old. The most numerous age group consisted of female respondents in the age category from 41 to 50; in this age there were 26 (31.7%) women. The least represented were women aged 60 and over; there were only 4 of them and made up 4.9% of the research sample. In the respondents, we investigated the method of delivery, which may have an impact on problems with urine leakage. Of the 65 interviewed women who had given birth in the past, 15.4% had their last vaginal birth induced by medication; 53.8% of respondents gave birth naturally vaginally; 24.6% of respondents gave birth by caesarean section; 6.2% of respondents gave their last birth by forceps.

In *Hypothesis 1*, we verified and compared the rate of stress, urge and overflow incontinence in two groups of women, pregnant and non-pregnant. For stress and overflow incontinence, the differences between the groups are very small. In urge incontinence, the differences are more pronounced between means and mean ranks. However, even here, the significant difference between the groups was not confirmed. According to our findings, none of the examined types of incontinence is related to pregnancy. In *Hypothesis 2*, we assumed that there is a statistically significant relationship between the number of births and urinary incontinence, but this hypothesis was not confirmed either. None of the examined types of incontinence is related to the number of births in a woman. According to Švabík-Martan (2003), the birth weight of the child over 4,000 g, mother's age over 30 years at the time of the first birth; a prolonged second birth period, but also a too short second birth period, with the use of Oxytocin, appear to be risk factors for incontinence as well as, forceps birth, episiotomy, obesity of the mother, when the BMI is higher than 30. A reduced risk of stress incontinence has been demonstrated in women who had their first birth by a planned caesarean section. On the contrary, with repeated caesarean sections, the risk of urge incontinence increases. It is again evident that there is a combination of both mechanical as well as metabolic and endocrine factors occurring simultaneously (11). The aim of the last hypothesis was to compare incontinence in groups of women who gave birth in different ways. We found a statistically significant association between the method of delivery and urinary incontinence in overflow and urge incontinence. Both types of incontinence are related to the delivery management. The impact on stress incontinence was not confirmed mainly due to the low number of women after a forceps birth.

Conclusion

Urinary incontinence is an extremely sensitive, professionally and economically demanding problem. Curing or improving urinary incontinence means a substantial improvement in the quality of life (12). The professional and lay public is relatively well informed about the various manifestations or pathologies of pregnancy, but there is still lack of awareness about pregnancy incontinence. However, this problem is taboo in society, and little attention is paid to prevention: both to the prevention of these problems itself and to the possibility of more effective treatment and prevention of recurrences. In the last 10 years, the diagnosis of urinary incontinence has undergone rapid development. Modern surgical procedures have been developed, but unfortunately even these do not always bring the expected effect. Approximately every fourth patient sooner or later has a recurrence of incontinence. We cannot forget the exact drug therapy and other conservative treatment procedures, including the often underappreciated special therapeutic gymnastics – strengthening the pelvic floor.

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