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# Anal Incontinence after Vaginal Delivery, Risk Factors and Quality of Life in Patients in North Macedonia

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**Abstract**

The aim of this study is to determine the impact of individual obstetric risk factors on occurrences of anal incontinence in patients after vaginal delivery, and its impact on quality of life. We designed the study as a cross-sectional, and developed the research at the University Clinic for Obstetrics and Gynecology, University of "Ss. Cyril and Methodius" in Skopje, Macedonia, over a period of one year. In this study, we engaged patients in their reproductive age, who had undergone at least one vaginal delivery (spontaneous or assisted vaginal delivery). The degree of incontinence was determined using St. Mark's Anal Incontinence Score (SMIS). We used a specific questionnaire related to anal incontinence to assess quality of life Fecal Incontinence Quality of Life Scale (FIQLS) Four hundred and seventy (470) patients were included in the study, 30% of which (141 patients) had St. Mark's scores ≥8. The following factors were found to influence the St. Mark's score: number of vaginal deliveries, delivery mode, fetal macrosomia, use of episiotomy and the existence of perineal lacerations Results of this study show consistency with data published so far on the influence of obstetric risk factors on occurrences of anal incontinence in patients after vaginal delivery. Changes in anal continence are expressed in increased St. Mark's score. Our study showed that the following factors had statistically significant impact on the score value: multi-parity, delivery mode, use of episiotomy, fetal macrosomia and perineal injury (grades 3 and 4).

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***Keywords:*** anal incontinence; vaginal delivery; risk factors; St. Mark's Anal Incontinence Score (SMIS); Fecal Incontinence Quality of Life Scale (FIQLS).

## 1. Introduction

There is something truly magical about becoming a mom. Most mothers agree that becoming a mom can be the most exciting and beautiful adventure they'll have in life. When it comes to childbirth, vaginal delivery is often the best way women have, after all, done it for thousands of years. But it mustn't be forgotten that natural birth actually comes with risks, including tearing, hemorrhage and incontinence for the mother. Patients are willing to discuss majority of the complications that can accrue as a result of a vaginal delivery, ask questions and seek information. But when anal incontinence is in question, most of them are not very keen to discuss this issue. Therefore, medical professionals are not in a position to register the problem or to help the patient. Anal incontinence (AI) is an unvoiced symptom. It is a stigmatizing medical condition, and a taboo for a sizeable share of female population. It is also the most undisclosed symptom and the one patients tend to keep silent about [1]. The term Anal Incontinence (AI) includes both fecal and flatal incontinence. Anal incontinence can be subdivided into several components: involuntary leakage of gas, solid, loose or liquid stools, passive leakage of stool (soiling or staining), and urgency incontinence. The terms anal incontinence and fecal incontinence are used some inconsequently, sometimes even as synonyms in medical texts [2]. Its etiology is multi-factorial: Anal sphincter weakness – Traumatic (obstetric, surgical) or Non –traumatic (scleroderma or internal sphincter degeneration of unknown origin); Neuropathy (peripheral or generalized e.g. diabetes mellitus); Disturbances of pelvic floor (rectal prolapse, descending perineum); Inflammatory conditions (Crohn's disease, ulcerative colitis); Central nervous system disorders, diarrhea or other [3]. Among women with no underlying systemic disease, diarrhea and rectal urgency are the strongest independent risk factors for AI. Although obstetric anal sphincter injury can cause immediate AI, it is more typical for this condition to begin 2 – 3 decades after vaginal delivery among unselected women [4]. These observations suggest that similar to urinary incontinence, obstetric pelvic floor injury is an important risk factor for postpartum AI. This condition is more common than generally perceived. There is contradicting data on whether the rate is higher among women than men [5]. Anal incontinence affects 9% of women aged 40 to 59 and 21% of women over 80 [6]. Yet, among women younger than 45, anal incontinence is considered to be eight times more common than in men - and the probable reason being childbirth [7]. Obstetric trauma is the most common reason for anal incontinence, among women after vaginal delivery. The damage to the pelvic floor, muscles, nerves and to the sphincter complex, may result in anal incontinence after delivery. Anal incontinence be a social and hygienic problem that can negatively influence people's quality of life [8]. AI can affect daily life and may predispose to institutionalization [9]. Up to 50 % of nursing home residents in one survey had AI [10]. This clinical entity can have a negative effect on the physical and mental health of the person, and can influence their everyday life with its limiting effect over their professional engagement, rest and social activities. Not less important is the effect of the condition over a person's sexual life [11]. Bearing in mind difficulties that affected people are facing, changes in their social and private lives, the uncomfortable diagnostic procedures and lack of effective treatment – it is essential to define factors contributing to anal incontinence. Considering that physiology of the ageing process contributes to incontinence, prevention of incontinence should be a priority [12]. What are the factors that influence the occurrences of AI among patients after vaginal delivery? They have been divided into obstetric, maternal and

fetal factors. Further categorization is into modifiable and non-modifiable factors. Maternal and fetal factors are non-modifiable, contrary to obstetrical factors that can be influenced on or modified [13]. If our aim is to prevent this condition, knowing the modifiable factors is crucial. Fetal and maternal factors are mostly non-modifiable (constant), such as parity, mother's age or baby's size. Obstetric factors, such as obstetric interventions, use of epidural anesthesia, use of episiotomy and different modalities of assisted vaginal delivery (application of vacuum extractor, forceps and different maneuvers applied for breach delivery), are most often evaluated as risk factors for AI. Many factors or clinical procedures undertaken during the second stage of labour, such as protection of the perineum, episiotomy and episiotomy method, may influence the occurrence of perineal injury of a certain degree, hence a potential occurrence of AI. These factors are difficult to examine due to no possibility of precise methodology of documentation and registration. Even more importantly, obstetric procedures and interventions (obstetric factors) can vary, at least to a certain degree, unlike the maternal and fetal characteristics. Diagnosis of anal incontinence is often based on patient's reporting it, and giving a subjective evaluation of symptoms experienced. There is no objective method for measuring anal incontinence. Most researchers use questionnaires to determine anal incontinence, most probably due to women's indisposition to admit this condition of such intimate nature, and most find it difficult to discuss it openly [14]. There are several grading systems developed for evaluation and description of prevalence and severity of anal incontinence symptoms, such as: Wexner's, St. Mark's and Pescatori's incontinence scores [15]. These systems measure the type of anal incontinence (gases, solid or liquid fecal incontinence and urgency) and the frequency of symptoms. There is no consensus on a clearly defined cut-off value for classifying patients as having anal incontinence or not. Scientific studies provide evidence that patients with St. Mark's score of $\geq 8$ experience changes in their quality of life [11, 16]. A severe form (and a frequent) anal incontinence can hinder person's outdoor activities due to the need for frequent access to toilet. For these reasons and the restrictions on life in general, anal incontinence influences quality of life significantly [11]. For the purpose of evaluation of the effects of anal incontinence on the quality of life, specific questionnaire composed of questions that are associated with anal incontinence know as Fecal Incontinence Quality of Life Scale (FIQLS) have been deigned. The Fecal Incontinence Quality of Life Scale is composed of 4 questions and 29 items. The instrument measures four domains: lifestyle (10 items), coping/behavior (9 items, subsequently referred to as "coping"), depression/self-perception (7 items, subsequently referred to as "depression"), and embarrassment (3 items). Responses are then averaged for each domain. Lower scores indicate lower quality of life. There is no established method for calculating an overall score [17]. To prevent this social, physical and psychological problem, requires defining risk factors that lead to occurrence and greater expression of anal incontinence among patients after vaginal delivery.

## 2. Material and methods

We designed this study as cross-sectional study. It was performed at the University Clinic of Obstetrics and Gynecology, University of "Ss. Cyril and Methodius" in Skopje, Macedonia during a period of one year. The study involved patients in reproductive age with at least 1 previous vaginal delivery. We have excluded from the study patients with anal incontinence from non-obstetric etiology which manifested itself before the first pregnancy, patients with anorectal and other conditions that can be described as independent risk factors for the occurrence of anal incontinence (anal fissures and lacerations, perineal fistulas, chronic inflammatory processes

such as Chron disease). We approached 500 consecutive patients hospitalized at the Department of Maternal and Neonatal Care, that have had at least one vaginal delivery in previous pregnancies, and that fulfilled inclusion criteria for the study. Four hundred and seventy (470) patients consented to participate in the study, all of which signed a written consent prior to engagement. Data of interest to the study was collected using a questionnaire specially designed for this study. We asked the participants to answer the questions themselves and offered assistance if some of them were unclear. The questionnaire included maternal, fetal and obstetric data that could represent risk factors for anal incontinence occurrence. Following variables were examined: place of residence (urban or rural environment), ethnicity, education, smoker or nonsmoker, BMI, advanced maternal age (≥35 years), parity (number of vaginal delivery), use of a vacuum extractor or forceps during delivery, application of episiotomy at delivery, existence of 3$^{rd}$ or 4$^{th}$ degree perineal tear, fetal macrosomia (birthweight ≥ 4000 g), prolonged second stage of labor (≥2 hours) and use of analgesia (epidural or spinal). The degree of incontinence was determined using St. Mark's Anal Incontinence Score as integral segment to the questionnaire. St. Mark's score varies from 0 (no anal incontinence) to 24 (complete anal incontinence). Considering the fact that scientific studies provide evidence that patients with St. Mark's score of ≥8 experience changes in their quality of life, we used value 8 as cut-off value in classifying patients into 2 groups for the purposes of statistical analysis: group 1 (St. Mark score <8) and group 2 (St. Mark score ≥8). In order to evaluate the effects of fecal incontinence on quality of life we used specific questionnaire composed of questions that are associated with anal incontinence know as Fecal Incontinence Quality of Life Scale (FIQLS), since this questionnaire has proven to be sensitive and valid. Approval for the study has been provided by the Ethics Commission for research on human subjects at the University of "Ss. Cyril and Methodius" in Skopje and from the University Clinic of Obstetrics and Gynecology – Skopje.

## 3. Statistical analysis

Questionnaires' data was digitally processed and entered in the database. Descriptive summary statistics were presented in table and char form, as appropriate. The influence of the different categorical variables on SMIS was tested using Mann Whitney's U test and Kruskal Wallis H test. The linear relationship of ordinal or continuous variables with the SMIS was tested using Spearman's rank order correlation test. All data processing and statistical analysis was done using IBM SPSS Statistics software package, version 23 (IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.). A value of $p \leq 0.05$ was considered statistically significant.

## 4. Results

Four hundred and seventy (470) patients were included in the study. The mean value of St. Mark's score in the group was 5.24, varying from 0 to 18, with SD od 3.44. Out of the total number of patients, in 70% (329) the value for St. Mark's score was < 8, and in 30% (141) the value for St. Mark's score was ≥8. The distribution of the patients according to the value of St. Mark's score, giving that the cut off value is 8, is presented in chart 1.

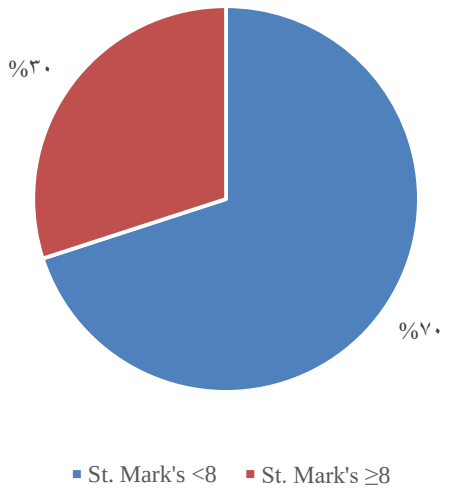


**Chart 1:** Distribution of patients according to St. Mark's score

For the question "Do you have incontinence of solid stool?", 167 (35.35%) of the participants answered "never", 156 (33.19%) of the participants answered "rarely" , 133 (28.3%) of the participants answered "sometimes", 8 (1.7%) answered "weekly" and 6 (1.28%) of the participants answered "every day". For the question "Do you have incontinence of liquid stool?", 140 (29.79%) of the participants answered "never", 156 (33.19%) of the participants answered "rarely", 156 (33.19%) answered "sometimes", 14 (2.98%) answered "weekly", and 4 (0.85%) of the participants answered "every day". For the question "Do you have incontinence of gas?", 91 (19.36%) of the participants answered "never", 139 (29.57%) of the participants answered "rarely", 188 (40%) answered "sometimes", 38 (8.09%) answered "weekly", and 14 (2.98%) of the participants answered "every day". For the question "Do you experience alteration in your lifestyle?", 249 (52.98%) of the participants answered "never", 74 (15.74%) answered "rarely", 132 (28.09%) answered "sometimes", 14 (2.98%) of the participants answered "weekly". Only 1 of the participants stated that she experiences alterations in her lifestyle on daily basis. For the question "Do you use hygienic pads?", 360 (76.6%) of the participants answered "No", while 110 (23.4%) answered "Yes". For the question "Do you need to use laxatives?", 416 (88.51%) of the participants answered "No", while 54 (11.49%) answered "Yes". For the question "Do you feel inability to postpone defecation for more than 15 min.?", 452 (96.17%) of the participants answered "No", and 18 (3.83%) of the participants answered "Yes". Table 1 represents the complete summary of the results from the questionnaire used to evaluate the continence status of the patients included in the study.

**Table 1:** St. Mark's Incontinence Score

| Incontinence for Solid stool | Never | Rarely | Sometimes | Weekly | Daily |
|---|---|---|---|---|---|
| **Solid stool, n (%)** | 167 (35.53%) | 156 (33.19%) | 133 (28.30%) | 8 (1.7%) | 6 (1.28%) |
| **Liquid stool, n (%)** | 140 (29.79%) | 156 (33.19%) | 156 (33.19%) | 14 (2.98%) | 4 (0.85%) |
| **Gas, n (%)** | 91 (19.36%) | 139 (29.57%) | 188 (40%) | 38 (8.09%) | 14 (2.98%) |
| **Alteratio in lifestyle, n (%)** | 249 (52.98%) | 74 (15.74%) | 132 (28.09%) | 14 (2.98%) | 1 |
| | | **No** | | **Yes** | |
| **Need to wear a pad or plug, n (%)** | | 360 (76.6%) | | 110 (23.4%) | |
| **Taking constipating medicine, n (%)** | | 416 (88.51%) | | 54 (11.49%) | |
| **Lack of ability to defer defecation for 15 min, n (%)** | | 452 (96.17%) | | 18 (3.83%) | |

Of the evaluated fetal, maternal and obstetrical factors that can influence the St. Mark's score value, our results showed that the number of vaginal deliveries, mode of delivery, birth weight, use of episiotomy and the degree of the obstetrical trauma of the perineum (degree of perineal tear) significantly increase the value of the St. mark's score.

**5. Number of vaginal deliveries**

Table 2 shows the distribution of the median values for the SMIS according to the number of vaginal deliveries. Out of the total number of patients, 269 (57.23%), have had one vaginal delivery, 144 (30.64%) have had two vaginal deliveries, 46 (9.79%) have had three and 11 (2.34%), of the participants in the study have had more than three vaginal deliveries. Patients with only one previous vaginal delivery, had a mean value for SMIS of 4.68, patients with two previous vaginal deliveries had a mean value for SMIS of 5.06, while the patients with three or more than three previous vaginal deliveries had a mean value for SMIS of 8.39 and 8.45 respectively. Multiparous patients (3 or more than 3 previous vaginal deliveries), presented higher values for SMIS. Our results presented a positive correlation between the number of vaginal deliveries and the mean value for SMIS (Spearman rank-order correlation, rho=0.271) with high statistical significance ($p<.001$), confirming the hypothesis that the value of the SMIS is directly proportional to the number of vaginal deliveries i.e. the higher the number of vaginal deliveries, the higher the value of SMIS.

**Table 2:** Mean value of the SMIS according to the number of previous vaginal deliveries

| No of vaginal deliveries | n (%) | Mean SMIS value | rho* | p |
|---|---|---|---|---|
| **One (1)** | 269 (57.23%) | 4.68 | 0.271 | <.001 |
| **Two (2)** | 144 (30.64%) | 5.06 | | |
| **Three (3)** | 46 (9.79%) | 8.39 | | |
| **More than three (> 3)** | 11 (2.34%) | 8.45 | | |
| *Spearman rank-order correlation | | | | |

**6. Type of vaginal delivery**

We also examined the type of vaginal delivery and it's effect on SMIS. The majority of patients had singleton vertex deliveries (404 patients, 85.96%), 38 patients (8.09%) had breach vaginal deliveries, 3 patients (0.64%) had twins delivered vaginally, 17 patients (3.63%) had vacuum extractions and 8 (1.7%) patients had forceps deliveries. The group of patients that had only spontaneous vaginal deliveries had statistically significant ($p<0.001$) lower mean values of SMIS, when compared with patients that had at least one maneuver/vacuum/forceps assisted vaginal delivery (Table 3).

**Table 3:** Distribution of mean SMIS values in relation to type of vaginal delivery

| Mode of vaginal delivery | n (%) | Mean SMIS value | Kruskal-Wallis H test p |
|---|---|---|---|
| **Vertex** | 404 (85.96%) | 4.85 | <.001 |
| **Breach** | 38 (8.09%) | 6.42 | |
| **Multiples** | 3 (0.64%) | 9 | |
| **Vacuum extractor** | 17 (3.62%) | 9.35 | |
| **Forceps** | 8 (1.7%) | 9.5 | |

**7. Birth weight**

A total of 162 patients (34.47%) had delivered at least one fetus with birth weight ≥4000g. The patients in this group had statistically significant ($p<0.005$) lower mean values for SMIS, compared to the other group of patients. Table 4 shows the summary results.

**Table 4:** Distribution of mean SMIS values in relation to fetal birth weight

| Birthweight | n(%) | Mean SMIS value | U‡ | p |
|---|---|---|---|---|
| **<4000g** | 308 (88.72%) | 4.91 | 21049.5 | .005 |
| **≥4000g** | 162 (34.47%) | 5.89 | | |

‡ Mann-Whitney U

**8. Use of episiotomy**

A large proportion of the studied series of patients (269 patients, 57.23%) had at least one delivery with a medio-lateral episiotomy, 165 patients (35.11%) had no episiotomies, while 36 patients (7.66%) had a median episiotomy. Patients with no previous episiotomies had a mean SMIS of 6.21, patients with at least one medio-lateral episiotomy had a mean SMIS of 4.55, while patients with at least one median episiotomy had a mean SMIS of 6.06 (Table 5).

**Table 5:** Distribution of mean values of SMIS in relation to episiotomy use

| Use and type of episiotomy* | n(%) | Mean SMIS value | Kruskal-Wallis H test p |
|---|---|---|---|
| **No** | 165 (35.11%) | 6.21 | <.001 |
| **Medio-lateral** | 269 (57.23%) | 4.55 | |
| **Medial** | 36 (7.66%) | 6.06 | |

*At least one delivery with an episiotomy

Patients with at least one medio-lateral episiotomy had significantly lower ($p<0.001$) mean values of SMIS, compared to patients with median episiotomy and patients with no episiotomy.

**9. Obstetrical perineal trauma**

When processing the data, we recorded the highest degree of obstetrical perineal trauma for patients with multiple events of perineal trauma. The majority of patients, however, had no perineal trauma (398 patients, 84.68%). Thirty four patients (7.23%) had first degree perineal tears, 21 patients (4.47%) had second degree tears, 16 (3.4%) had third degree tears, while only one patient had a fourth degree perineal tear. Patients with at least one high grade ($2^{nd}$, $3^{rd}$ or $4^{th}$ degree) perineal tear had a mean values for SMIS of 7.81, 9.19 and 15, respectively, while patients with $1^{st}$ degree perineal tears and patients with no obstetric perineal trauma had mean SMIS values of 5.03 and 4, respectively. The statistical analysis revealed a positive (rho=0.158), statistically significant ($p<0.001$) correlation between the degree of obstetric perineal trauma and the SMIS value (Table 6).

**Table 6:** Distribution of mean SMIS values in relation to the degree of obstetric perineal trauma

| Degree of perineal tear | n(%) | Mean SMIS value | rho* | p |
|---|---|---|---|---|
| **None** | 398 (84.68%) | 5.03 | 0.158 | <.001 |
| **Grade I** | 34 (7.23%) | 4 | | |
| **Grade II** | 21 (4.47%) | 7.81 | | |
| **Grade III** | 16 (3.4%) | 9.19 | | |
| **Grade IV** | 1 (0.22%) | 15 | | |

*Spearman rank-order correlation

**10. Relation of St Mark's incontinence score with the quality of life**

FIQL was used to quantify the quality of life of patients in the studied population. We identified a negative, statistically significant ($p<0.001$) correlation between SMIS and all four FIQL domains: life style, coping, depression and embarrassment (Rho -0.186, -0.286, -0.232,-0.217, respectively). The results of the correlation test are summarized in Table 7.

**Table 7:** Correlation of SMIS with FIQL domains

| Domain | rho* | p |
|---|---|---|
| **FIQL I Lifestyle** | -0.186 | <0.001 |
| **FIQL II Coping** | -0.286 | <0.001 |
| **FIQL III Depression/ self-perception** | -0.232 | <0.001 |
| **FIQL IV Embarrassment** | -0.217 | <0.001 |
| *Spearman rank-order correlation | | |

## 11. Discussion

Anal incontinence is not a condition encountered seldom, however the exact incidence rate of anal incontinence is largely unknown. Incidence rates vary in different studies, probably owing to the difference in definition and/or inclusion and exclusion criteria in the studies. There are evidence that anal incontinence is eight times more frequent in women than in men, and it is speculated that this is linked to labor and delivery. It is believed that substantial proportion of cases are undiagnosed owing to the unwillingness of patients to freely discuss/report and ask about the condition. The lack of exact epidemiological data, combined with the latter implies the need for screening for anal incontinence in a health care setting. This illustrates one of the primary aims of the study – to determine the prevalence of anal incontinence in reproductive-age women with one or more previous vaginal deliveries. The ultimate goal of epidemiological research is the prevention of disease. If this principle is applied to the present study then the goal is to obtain information leading to the prevention of the unwanted consequences of childbirth on pelvic floor function. Such information would not only be useful to guide the evidence-based practice of doctors involved in delivery care but also provide useful information for women in their decision-making with regard to mode of delivery. Basic questions of our scientific inquiry primarily address the influence of the defined obstetrical factors on the manifestation of anal incontinence, presented as an increase in the value of St. Mark's score. We evaluated the influence of each of the individual factors, as independent variables, over the value of St. Mark's score. Furthermore, we evaluated the influence of each of the individual factors, as independent variables, over the value of St. Mark's score. Lastly, we examine the impact of incontinence on the quality of life. Although St. Mark's scoring system enables classification of anal incontinence severity, its drawback as well as those of all the other most commonly used scores, is that there is no consensus on the cut-off value [16] . Since there is no such consensus for quantifying anal incontinence, it was a challenge for us to evaluate anal incontinency. Anal incontinence has a negative effect on the quality of life. The more prevalent it is, the more it negatively affects quality of life [18-19] . However, when anal incontinence and quality of life are assessed simultaneously, significant association is found only among women with a comparatively high anal incontinence score (St. Mark's > 8). Women with a lower score did not report a significant impact on their quality of life. [16] Because of this, in our study, the value of 8 was used as a cut-off value for the classification of patients in two groups. The study identified statistically significant differences in the mean values of SMIS, between patients stratified by: number of vaginal deliveries, delivery mode, fetal macrosomia, use of episiotomy and the existence of perineal lacerations. The number of vaginal deliveries is a significant risk factor for the onset of anal incontinence. In a prospective study performed

on 59 patients who had two successful vaginal deliveries, 22% of patients who had responded to the questionnaire, have reported anal incontinence after the first vaginal delivery [20]. This suggests that patients who have had occult lesions on the anal sphincter at first delivery, and temporary symptoms of anal incontinence, have had already existing symptoms of incontinence worsened after the second delivery. In our study, we show that the increase in the number of vaginal deliveries has a positive correlation with score values. In our series, we identified a positive, statistically significant correlation between the number of vaginal deliveries and SMIS ($p<0.001$), indicating that the higher number of vaginal deliveries proportionately increases the risk for anal incontinence. The subset of multiparous patients (with 3 or more previous vaginal deliveries) had the highest mean SMIS (8.45) comparative to the patients with only one previous vaginal delivery (4.68) in the current study. Instrumental deliveries have historically been considered as events that increase the risk of anal sphincter injury and simultaneously anal incontinence [21, 22]. There are, however, contradictory views in the published literature. In a systematic review [23], vacuum and forceps assisted deliveries were idetified as independent risk factors for anal incontinence. In a controlled, randomized trial [24] evaluating the symptoms and changes in anal continence in patients with vacuum extraction, 33% of patients with vacuum extraction had changes in anal continence, compared to 59% of patients with forceps deliveries [25]. Our series identified only a small proportion of patients with operative vaginal deliveries (approximately 1%), compared to the average of 10% in the region, which limits the interpretation of data. Our data showed that patients that had no previous operative vaginal delivery had lower SMIS values (4.85 for vertex), comparative to patients with at least one maneuver/operative vaginal delivery (9.5 for forceps and 9.35 for vacuum delivery). This difference has shown to be statistically significant ($p<0.001$), confirming our hypothesis that operative vaginal delivery increases the risk for anal incontinence. There is a strong correlation between macrosomia and damage to the pelvic floor and the development of anal incontinence. Macrosomia itself is a strong independent risk factor for perineal injuries, especially third and fourth degree perineal injuries, as well as injuries to the anal sphincter. They are a consequence of the greater circumference of the fetal head, as well as the risk of prolonged delivery and operative vaginal delivery[26]. Sizeable cohort study conducted in Norway showed that the weight of newborns over 4,000 grams increased the risk of perineal lacerations as much as 2.7 and 4.2 times, respectively, compared to the birth of a newborn weighing 3,000 to 3,499 grams [27]. The presented data shows that patients with at least one vaginal delivery of a fetus with birth weight over 4000g had significantly ($p=0.005$) higher values for SMIS, compared to patients with fetuses with birth weight under 4000g (5.89 versus 4.91). Historically, episiotomy was both a strategy for prevention of fetal trauma, as well as maternal perineal trauma and it has been performed as a routine procedure since 1900. Many studies aim to determine its benefits. [28] A study of 949 patients from 2002 compares the degrees of perineal injuries. The goal of the study was to determine the protective effect of episiotomy in primiparas women with spontaneous vaginal deliveries. Most patients had documented perineal trauma, although not severe, which affected the muscular structures of the perineum. The absence of episiotomy was the only independent factor associated with second degree perineal trauma. [29] Therefore, the use of episiotomy has been shown to be a visible protective factor for this type of perineal trauma. Results of our study are consistent with the published data. In the current series, patients with at least one mediolateral episiotomy had significantly lower SMIS values, compared to patients with no episiotomy and patients with median episiotomy ($p<0.001$) Perineal injuries are common in vaginal delivery and are almost unavoidable in forceps-assisted deliveries. In a study performed on 489 primiparas, 91% had some degree of

perineal trauma. [30] Even a minimal trauma, first or second degree perineal injuries, should be treated with particular care as they have an effect on muscular structure. According to the Royal College of Obstetricians and Gynecologists, the classification of perineal injuries is of first, second, third or fourth degree: first degree - injury to the perineal skin only, second degree - injury to the perineum involving the perineal muscles but not involving the anal sphincter, third degree - injury to the perineum involving the anal sphincter complex, and fourth degree - injury to the perineum involving the anal canal sphincter complex and anal epithelium. [31] According to results collected in our study, the obstetrical perineal injuries of third and fourth degree are one of the most significant risk factors for anal incontinence. The patients with $2^{nd}$, $3^{rd}$ or $4^{th}$ degree perineal tears had average SMIS values of 7.81, 9.19 and 15, respectively, while patients with no perineal tear and $1^{st}$ grade perineal tears had SMIS values of 5.03 and 4, respectively. The analysis identified a positive and statistically significant correlation between the degree of obstetric perineal trauma and SMIS (rho=0.158, p<.001), confirming the hypothesis that higher degree of perineal tears, higher the risk for anal incontinence. Anal incontinence negatively impacts quality of life. The higher the degree of incontinence, the larger the impact on the quality of life [8-16]. However, when anal incontinence and quality of life are quantified simultaneously, a significant impact on quality of life was identified only in patients that scored >8 on SMIS [11]. The interpretation of the data is somewhat speculative, partly owing to the fact that most women adapt to living with anal incontinence and accept the associated changes in quality of life, without perceiving them as negative. Furthermore, a number of studies published data that most women do not approach their health care providers with anal incontinence related issues, nor do they describe any episodes of anal incontinence to their general practitioners, which in all likelihood is the major reason why anal incontinence is largely undiagnosed and/or under-reported. The reason why women do not seek help could very well be the shame [1] associated with anal incontinence, which lowers their willingness to admit they have a continence problem. However, women with more severe symptoms are more likely to seek medical help compared to women with mild symptoms [32]. Patients in studies reported that anal incontinence had a detrimental effect on their emotional health [33, 34]. A study including 1050 women with symptoms of anal incontinence, 2 years after delivery, where the participants filled out questionnaire relating to the quality of life in anal incontinence published that among women with anal incontinence, 51% reported frustration caused by anal incontinence, 26% reported that anal incontinence affected their emotional health, 18.5% reported anal incontinence affected their child-caring abilities, and 16.2% reported a negative effect on social activities. Even 2 years after delivery, more than a quarter of women who experience a new onset of anal incontinence after childbirth report persistently negative QOL [8]. Despite this, few women discuss anal incontinence with their medical providers. A study including 368 patients with anal incontinence caused by vaginal delivery, identified a negative significant correlation between the incontinence score and the quality of life [16]. Our data showed identical there was a statistically significant (p<0.001), negative correlation between SMIS and all four domains of FIQL: life style, coping, depression and embarrassment (Rho -0.186, -0.286, -0.232,-0.217, respectively). Main limitation of the study is the use of a questionnaire in which the answers were provided by the patients themselves without, a help of a health care professional. This approach provides a possibility for a more sincere answers from the participants, considering the embarrassing character of this issue, but not seldom, the complexity of the questions and misunderstanding of the questions may result in answers that do not reflect the true severity of the condition. Furthermore, as in many of the previous studies targeting this clinical entity, so in this one as well, the lack of accurate definition of

the term “anal incontinence” hampers the ability to accurately describe the prevalence of this condition.

## 12. Recommendations

Based on the results of this study, as well as the results of the previously conducted research we give following recommendations:

- Obstetricians should pay more attention to possible symptoms of anal incontinence after childbirth in order to develop appropriate delivery plan in future pregnancies,
- Despite the existing recommendations for restrictive approach to the use of episiotomy, obstetricians should be aware of the appropriate use of episiotomy can prevent perineal tears of higher degree (grade 3 and 4), which have been proved to be highly associated with development of anal incontinence. Having this in mind, mediolateral episiotomy is recommended,
- Obstetricians should be also be advised that in cases of high estimated fetal weight relative to the mother, occiputposterior presentation or other settings in which operative vaginal delivery is necessary, cesarean delivery should be considered as an alternative, especially if the estimate suggest a necessity for rotational vacuum or forceps.

## 13. Conclusion

Anal incontinence is a condition that affects people regardless of their age, and in many cases fundamentally changes their normal functioning. Considering the disgraceful nature and its taboo status, it is a necessity to address the condition, as it can be treated. Regardless of the multifactorial etiology of anal incontinence, there is convincing evidence that vaginal delivery is the most common cause of it among female population. The efforts are aimed at preventing the condition, as well as defining the risk factors that can lead to damage of the pelvic floor intrapartum, which as a result can lead to incontinence of different types and of varying degrees. It is also important to define the factors that have a protective effect on the pelvic floor. Given that deliveries are performed under continuous supervision of doctors, it is considered to be the ideal moment for its prevention. Anal incontinence, is a burdensome condition that significantly impacts quality of life. Patients have reported that AI affects psychosocial functioning, work and travel, and patients may face social stigma, embarrassment and depression. Our study shows that the objective assessment of severity of anal incontinence, using the SMIS, correlates to its impact on QoL Results of this study show consistency with data published so far on the influence of obstetric risk factors on occurrences of anal incontinence in patients after vaginal delivery. Changes in anal continence are presented as an increase of value of St. Mark’s Score. Our study showed that the following have a statistically significant impact on the increase of score values, and thus on incontinence: multiparity, delivery mode, fetal macrosomia, and perineal injuries (level 3 and 4), whereas the use of episiotomy has a protective effect on the anal complex. In this group of patients, the values of St. Mark’s score were below the cut-off value of our study.

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