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MATERNAL-FETAL MEDICINE

The preferred mode of delivery of medical professionals and non-medical professional mothers-to-be and the impact of additional information on their decision: an online questionnaire cohort study

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Abstract

Purpose It was the aim to evaluate the personal preference of mode of delivery and to analyze differences between medical professionals and non-medical professionals. Interest in participating in a risk stratification system was evaluated. We hypothesized that gaining information about risk stratification provided in the survey could potentially change participants' decision regarding the preferred mode of delivery; therefore, subjects were asked twice (before and after providing information).

Methods Five cohorts [four professionals (MP) including participants of the German Urogynecology Congress 2017, employees of two major university hospitals in Germany, and members of the German Society of Gynecology and Obstetrics, and one non-professional group (NP) including pregnant women] were invited online to participate in this survey.

Results Vaginal delivery was the preferred mode of delivery in both groups (MP 90.4% vs. NP 88.8%; $p = 0.429$). MP are more likely to opt for CS due to concerns regarding pelvic floor disorders (MP 56.6% vs. NP 9.1%; $p < 0.001$). Likewise, parity and prior experienced CS (pCS) had a significant impact on the decision towards vaginal delivery (parity MP OR 7.5 95% CI 4.6–12.3, NP OR 9.3 95% CI 1.9–44.2; (pCS) MP OR 0.12 95% CI 0.07–0.19, NP OR 0.05 95% CI 0.01–0.25). There is great interest in participating in risk stratification systems in the majority of participants (68.9%).

Conclusions MP and NP prefer vaginal birth for themselves or their partners. Within the group that opted for CS, MP were significantly more often concerned about pelvic floor disorders. Future prevention aspects might include education about pelvic floor disorders.

Keywords Delivery: cesarean section · Labor: management · Medical education · Risk management · Statistics: epidemiological surveys · Urogynecology

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Introduction

There has been an ongoing discussion and debate about the optimal rate of cesarean section (CS) including CS on maternal request [1]. Many efforts have been made to reduce the CS rate [2].

Although cesarean delivery on maternal request (CDMR) does not seem to have great impact on the overall CS rate, as it has been described as 3% of all CS [3], personal preferences regarding mode of delivery remain important in the area of medical decision making. The reasons why an expectant mother may opt for CS are complex and multifactorial [4], and the decision may be influenced by the

preferences of both medical health care providers and the lay patients themselves, especially in the gray area of uncertain indication for CS. There are a variety of obstetrical and neonatal factors that need to be taken into account [5–8] to develop comprehensive counselling about "the best" mode of delivery for both expectant mothers and their newborns. Additionally, much effort has been placed into gaining insights about pelvic floor disorders, their association to pregnancy and delivery, and potential methods of injury prevention and protection of the pelvic floor [9].

Within the last decades, there was an intensive discussion about whether or not CDMR might have protective effects for women to prevent pelvic floor disorders [9]. This discussion led to an increasing interest to find "the ideal mode of delivery". Today, we know that CS cannot be offered to prevent pelvic floor disorders in general [9]. However, a small population being at a high risk for those problems might actually benefit from CS. It is crucial to identify these women to discuss potential prevention effects of CS for them in an individualized manner. The system of risk stratification, such as UR-CHOICE helps us to identify these women [10, 11]. UR-CHOICE provides a risk calculation of the long-term prevalence of pelvic floor disorders depending on demographic variables and mode of delivery [11].

It was the objective of this prospective online questionnaire study to evaluate five different groups of both medical professionals and one non-medical professional control group regarding their preferred mode of delivery and their interest in risk stratification systems such as UR-CHOICE [10, 11] and a pessary therapy to support postpartum recovery. A secondary objective was to analyze the possible effect on mode of delivery preference, after providing specific information regarding the pelvic floor.

Methods

According to our study design, the aim was to compare five cohorts regarding their personal preference of mode of delivery. Those five cohorts included four groups of medical professionals and one non-medical professional (lay) control group who were pregnant at that time.

Regarding the study population, the group of medical professionals included: Group 1: all participants of the German Urogynecology Congress in Stuttgart, Germany, 2017 (432 registered delegates); Group 2: all employees of the University Hospital of Tuebingen, Germany (approx. 9.000 employees); Group 3: all employees of the University Hospital of Heidelberg, Germany (approx. 10.000 employees); as well as Group 4: all members of the German Society of Gynecology and Obstetrics (approx. 8.000 members). The control Group 5 of non-professionals consisted of pregnant women who sought medical care either at the Prenatal Care Unit of the University Hospital of Tuebingen, Germany, or at their general OB/GYN practitioners in their local area; see Fig. 1 for description of groups.

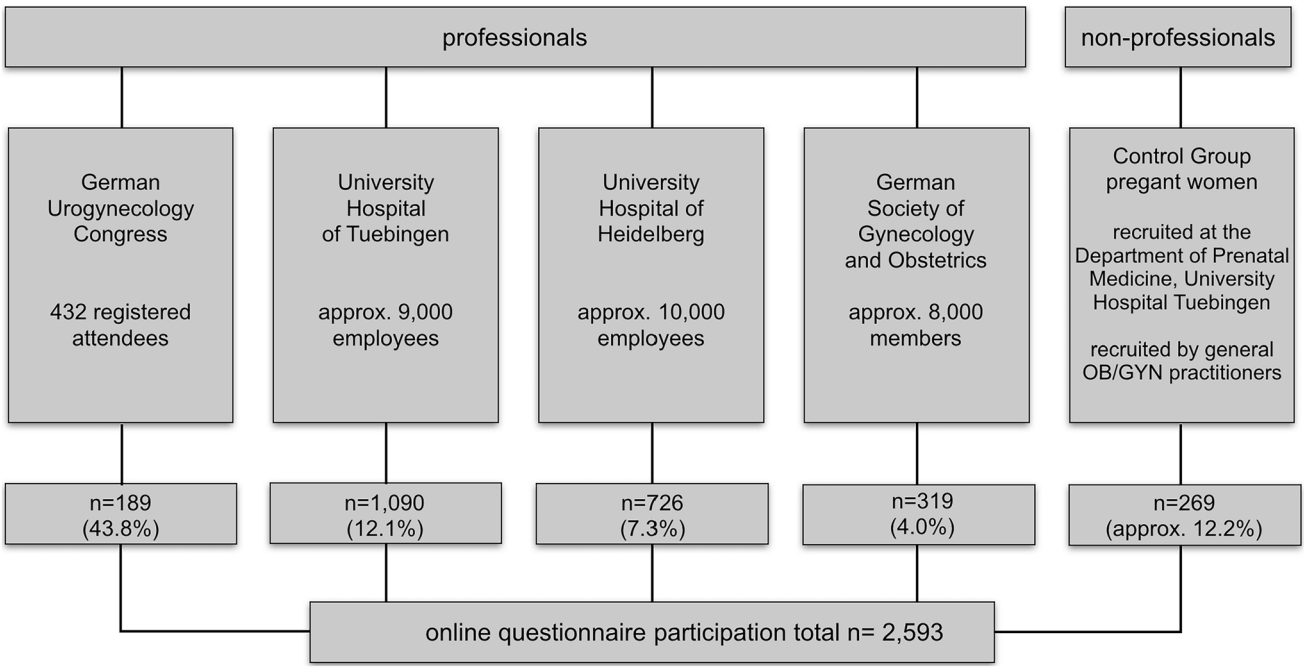

Fig. 1 Description of Study Groups. The four professional groups and their percentage of participation in relation to the complete sample are shown. Additionally, the non-professional control group is displayed

Since no validated questionnaires were available in the German language regarding this topic, an online questionnaire was developed for this study as described previously [12]. The purpose of the questionnaire was to not only analyze specific questions regarding participants' preferred mode of delivery, but also to provide detailed information about risk stratification systems such as UR-CHOICE [10, 11] and to look for potential changes in participants' opinions after having received this specific information. Therefore, the initial question about the preferred mode of delivery, as our primary endpoint, was asked twice: in the beginning of the survey and after providing specific information about the system of risk stratification. The survey included demographic questions about age, gender, occupation, medical field, pregnancy, number of children, previous experienced mode of delivery as well as level of knowledge about vaginal delivery and cesarean section. Furthermore, we asked study-related questions regarding interest in epidural anesthesia, willingness to participate in a risk stratification system and interest in a pessary therapy to support postpartum recovery as secondary outcome variables.

The original questionnaire (translated into English) is attached to the Appendix.

Inclusion criteria were defined as follows: in the four professional groups, all invited participants had to be either delegates of the Urogynecology Congress in 2017 (Group 1), had to be employees of the two mayor university hospitals (Groups 2 and 3) or members of the German Society of Gynecology and Obstetrics (Group 4). They were eligible to fill out the questionnaires, regardless of whether they already have had children or not, whether they would like to have children or not, or were female or male. Since male professionals are also involved in the consultation of pregnant women and thereby also might affect this decision, male participants were asked to answer questions as they would choose for their wives, partners or friends. In the reference Group 5, the inclusion criterion was to be pregnant at the time of study participation. In all five groups, sufficient German language skills to understand the questionnaire and legal age were mandatory.

Participants not meeting these criteria were not invited and, therefore, excluded.

Recruitment period was from April 2017 through March 2018. All medical professionals received the survey link via email as well as reminder emails. The control group received an invitation card at the front desk of their general OB/GYN practitioner or at the Prenatal Care Unit of the University Hospital of Tuebingen.

Statistical methods

Regarding software and statistics, we used Enterprise Feedback Suite Summer 2017 (Questback Cologne, Germany) as a survey tool. Data security was confirmed by the German Federal Office for Information Security (ISO 27001 certificate). Data were collected anonymously without IP address tracking.

Descriptive statistics including means for continuous measures and frequency tables for categorical measures were obtained for each group. Chi-square goodness of fit tests were used to assess differences between the groups for categorical measures of interest and Bowker's test was used to test for changes over time. A multiple logistic regression was used to assess independent predictors (e.g., age or gender) of the personal preferred mode of delivery, vaginal compared to cesarean or unsure. All analyses were performed using Stata (version 15.1) and SPSS Version 24 (IBM. Corp., Armonk, NY, USA). A significance level of $p < 0.05$ was set a priori and a previous power analysis indicated that a minimum of 155 participants was needed in each group to achieve 80% statistical power, assuming 95% confidence and a two-sided statistical test.

At the time of study design, the core outcome set "pelvic floor disorders" was still ongoing and, therefore, has not been used in this project. There was no patient involvement.

The study was approved by the local ethics committee of the University of Tuebingen (Ethic Committee Eberhard-Karls-University Tuebingen, Germany, 91/2017BO2, 02/28/2017); subjects gave consent initially prior to any answer. The study has been registered at clinicaltrials.gov (NCT03131830). There was no funding.

Results

In summary, a total of $n = 2593$ questionnaires were analyzed and $n = 2324$ (89.6%) were medical professionals, whereas $n = 269$ (10.4%) were non-medical professional pregnant women representing the control group. See Table 1 for the detailed description of the sample including demographic information. See Fig. 1 and Table 1 for response rates.

Analyzing all participants, $n = 2339$ (90.2%) prefer a vaginal delivery for themselves or their female partners, wives or friends, while $n = 157$ (6.1%) opted for cesarean section, and $n = 97$ (3.7%) were unsure regarding this decision. Medical professionals (Group 1–4: $n = 2100$) prefer vaginal delivery in 90.6%, the pregnant women's control group ($n = 239$) in 88.8%, the differences between the groups were not statistically significant. In Table 2, the detailed comparison within and between the professional and non-professional groups is shown. As it was expected, participants of the Urogynecology Congress (Group 1) were more likely to choose cesarean section for themselves or their partners compared to Groups 2–4 ($p < 0.003$). In the sub-analysis of OB/GYN physicians, obstetricians were more likely to opt for vaginal delivery than urogynecologists ($n = 185$; 96.4% vs. $n = 121$; 83.4%;

Table 1 Demographics and profession

Group	Medical professionals				Non-professional control group
	Group 1	Group 2	Group 3	Group 4	Group 5
	German Urogynecology Congress 2017	University Hospital Tuebingen	University Hospital Heidelberg	German Society of Gynecology and Obstetrics	Pregnant women University Hospital of Tuebingen and general OB/GYN practitioners
Group description					
Estimated sample in total	432	9000	10,000	8000	Approx. 2200
No. recruited	189	1090	726	319	269
% of participation	43.8	12.1	7.3	4	Approx. 12.2
Age (mean ± SD)	44.7 ± 10.0	40.7 ± 11.5	39.8 ± 10.8	44.6 ± 12.0	32.6 ± 4.3
Gender					
Female	126 (66.7)	897 (82.3)	575 (79.2)	238 (74.6)	269 (100)
Male	63 (33.3)	193 (17.7)	151 (20.8)	81 (25.4)	
Profession					
Physician—OB/GYN	170 (96.6)	54 (23.8)	14 (7.2)	315 (100)	n/a
Urogynecologist	142 (85.5)	1 (0.4)	1 (0.5)	26 (8.3)	n/a
Obstetrician	36 (21.7)	19 (8.4)	5 (2.6)	157 (49.8)	n/a
Another field in OB/GYN	29 (17.5)	33 (14.5)	10 (5.1)	116 (36.8)	n/a
Physician—another discipline	7 (3.9)	173 (76.4)	181 (93.0)	–	n/a
Midwife/midwife in training	–	59 (5.4)	5 (0.7)	–	n/a
Nurse (incl. surgical/anesthesiological nurse)	5 (2.7)	247 (22.6)	199 (27.5)	–	n/a
Administration	–	228 (20.9)	62 (8.4)	–	n/a
Other	7 (3.7)	329 (30.2)	265 (36.6)	4 (1.3)	n/a
Pregnant (n = yes, %)	3 (1.6)	38 (3.5)	42 (5.8)	20 (6.3)	269 (100)
Own children (mean ± SD)	1.46 ± 1.26	1.19 ± 1.17	1.08 ± 1.17	1.62 ± 1.18	0.66 ± 0.81
thereof	60 (31.7)	437 (40.1)	306 (42.1)	69 (21.6)	136 (51.9)
No children at least one child	129 (68.3)	653 (59.9)	420 (57.9)	250 (78.4)	126 (48.1)
Experienced mode of delivery[a]					
Vaginal	97 (75.2)	494 (45.3)	301 (41.5)	195 (61.1)	87 (32.3)
Vaginal operative (forceps/vacuum)	13 (10.1)	120 (11.0)	48 (6.6)	32 (10.0)	20 (7.4)
Elective/primary CS	28 (21.7)	89 (8.2)	72 (9.9)	39 (12.2)	23 (8.6)
Secondary CS	26 (20.2)	116 (10.6)	82 (11.3)	49 (15.4)	30 (11.2)

CS cesarean section, *n/a* questions were not included in the questionnaire

Data are presented as n (%) or mean ± standard deviation

[a]Birth mode of preceding own pregnancies or partners pregnancies, multiple answers possible

$p < 0.001$). In addition, significant differences could be found between OB/GYN physicians and midwives in opting for vaginal birth ($n = 502$; 90.8% vs. $n = 64$; 100.0%; $p = 0.04$).

Out of those who opted for cesarean section, there were significant differences in their reasons for choosing this mode of delivery. Concerns about fetal morbidity were the main reason, followed by all types of pelvic floor disorders in the professional group. However, concerns about pelvic floor disorders were not important for the non-medical professional pregnant control group ($p < 0.001$). The significantly different views of pregnant women and medical professionals regarding the pelvic floor disorders are consistent, independent of occupational group, medical specialty or specialisation of the medical professionals ($p < 0.001$). The main reasons in descending sequence are shown in Fig. 2.

The analysis of personal factors regarding the preferred mode of delivery reveals that having children or having experienced a cesarean section before has a significant impact on the preference of a vaginal birth. However, no significant correlation between age and gender in relation to the mode of delivery was found, even though the NP group was significant younger. See Tables 1 and 3 for details.

Table 2 Results

Group	Medical professionals					*P* value	Non-professional control group	*P* value
	Group 1 German Urogynecology Congress 2017	Group 2 University Hospital Tuebingen	Group 3 University Hospital Heidelberg	Group 4 German Society of Gynecology and Obstetrics (DGGG)	Combined Medical professionals	Comparison within professional Group	Group 5 Pregnant women University Hospital of Tuebingen and general OB/GYN practitioners	Comparison between professional and non-professional Group
What is your preferred mode of delivery?								
Vaginal	160 (84.7)	997 (91.5)	664 (88.7)	299 (93.7)	2100 (90.4)	Group 1/2 0.003*	239 (88.8)	0.429
CS	23 (12.2)	51 (4.7)	47 (6.5)	14 (4.4)	135 (5.8)	Group 1/3 0.13	22 (8.2)	
Unsure	6 (3.2)	42 (3.9)	35 (4.8)	6 (1.9)	89 (3.8)	Group 1/4 0.001*	8 (3.0)	
						Group 2/3 0.054		
						Group 2/4 0.19		
						Group 3/4 0.012*		
Would you like to have an epidural anesthesia?								
Yes	78 (41.3)	276 (25.3)	249 (34.3)	121 (37.9)	724 (31.2)	Group 1/2 < 0.001*	64 (23.8)	0.034*
No	35 (18.5)	361 (33.1)	190 (26.2)	74 (23.2)	660 (28.4)	Group 1/3 0.06	79 (29.4)	
Unsure	76 (40.2)	453 (41.6)	287 (39.5)	124 (38.9)	940 (40.4)	Group 1/4 0.45	126 (46.8)	
						Group 2/3 < 0.001*		
						Group 2/4 < 0.001*		
						Group 3/4 0.44		
Willingness to participate in a risk stratification								
Yes	158 (83.6)	716 (65.7)	507 (69.8)	257 (80.6)	1638 (70.5)	Group 1/2 < 0.001*	148 (55.0)	<0.001*
No	21 (11.1)	177 (16.2)	97 (13.4)	32 (10.0)	327 (14.1)	Group 1/3 < 0.001*	61 (22.7)	
Unsure	10 (5.3)	197 (18.1)	122 (16.8)	30 (9.4)	359 (15.4)	Group 1/4 0.25	60 (22.3)	
						Group 2/3 0.14		
						Group 2/4 < 0.001*		
						Group 3/4 0.001*		
Interested in a pessary therapy for postpartum recovery								
Yes	122 (64.6)	457 (41.9)	299 (41.2)	134 (42.0)	1012 (43.5)	Group 1/2 < 0.001*	98 (36.4)	0.047*
No	42 (22.2)	334 (30.6)	217 (29.9)	121 (37.9)	714 (30.7)	Group 1/3 < 0.001*	86 (32.0)	
Unsure	25 (13.2)	299 (27.4)	210 (28.9)	64 (20.1)	598 (25.7)	Group 1/4 <0.001*	85 (31.6)	
						Group 2/3 0.78		
						Group 2/4 0.01*		
						Group 3/4 0.004*		

Chi-square test was used to assess differences between the groups

Data are presented as *n* (%) *CS* cesarean section

*Shows significant differences between the groups, the significance level was set at $p < 0.05$

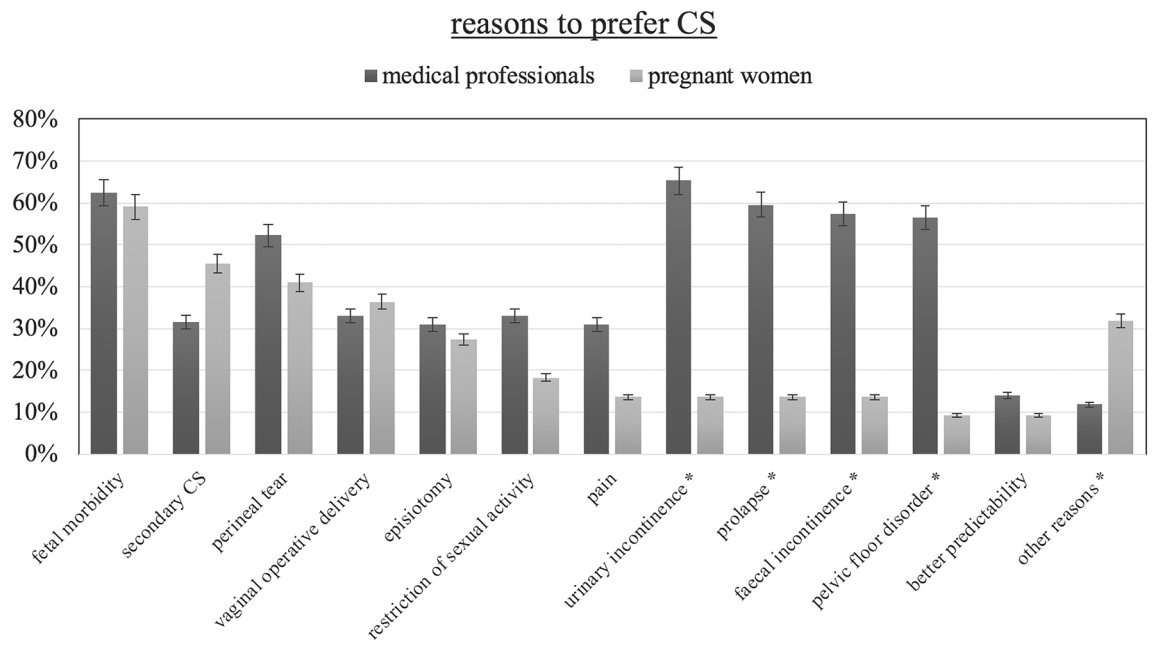

Fig. 2 The main reasons for a cesarean section in the group of medical professionals and pregnant women in descending sequence. *$p < 0.001$ shows significant differences between the groups

Table 3 Personal factors influencing the preference for vaginal birth

Influencing factors	OR 95% CI
Parity (at least one child)[a]	
MP	OR 7.5 95% CI 4.6–12.3
NP	OR 9.3 95% CI 1.9–44.2
Previous CS[b]	
MP	OR 0.12 95% CI 0.07–0.19
NP	OR 0.05 95% CI 0.01–0.25
Gender (male)[c]	
MP	OR 0.62 95% CI 0.45–0.87
NP	Female participants only
Age	
MP	OR 0.99 95% CI 0.97–1.00
NP	OR 0.95 95% CI 0.85–1.06

Derived from two multiple logistic regression analysis of either medical professional or pregnant women

MP medical professionals, *NP* non-professional mothers-to-be, *CS* cesarean section, *OR* odds ratio

[a]No child

[b]Vaginal delivery only

[c]Female

Among respondents, $n = 788$ (30.4%) stated preference for epidural anesthesia during labor, whereas $n = 739$ (28.5%) would refuse an epidural and $n = 1066$ (41.1%) were unsure regarding this decision. Medical professionals (Group 1–4: $n = 724$; 31.2%) were significantly more likely to choose epidural anesthesia compared to the non-professional group (Group 5: $n = 64$; 23.8%; $p = 0.034$). More information regarding the difference between the groups is shown in Table 2. In this regard, the sub-analysis also reveals that physicians were significantly more likely to opt for epidural anesthesia for themselves compared to non-physicians ($n = 388$; 42.5% vs. $n = 336$; 23.8%; $p < 0.001$). In addition, the request on epidural anesthesia differs significantly between OB/GYN physicians and midwives ($n = 216$; 39.1% vs. $n = 3$; 4.7%; $p < 0.001$).

Out of all participants, a majority of $n = 1786$ (68.9%) stated their willingness to participate in a risk stratification system, which is intended to determine one's personal risk of developing a pelvic floor dysfunction. The professionals were significantly more likely to agree to participate in such a system compared with the non-professionals (Groups 1–4: $n = 1638$; 70.5% vs. Group 5: $n = 148$; 55.0%; $p < 0.001$). The result of a sub-analysis also reveals that physicians would participate in risk stratification systems significantly more often compared to non-physicians ($n = 753$; 82.4% vs. $n = 885$; 62.8%; $p < 0.001$). For details of the different groups see Table 2.

Furthermore, the provided information about the risk stratification system did not result in a significant change of mind regarding the personally preferred mode of delivery in either the professional group or in the non-professional group (Group 1–4: $p = 0.137$; Group 5: $p = 0.214$).

Regarding the pessary therapy to support postpartum recovery, $n = 1110$ (42.8%) showed interest in such a therapy.

Likewise, medical professionals were more interested than non-professionals in this therapy (Groups 1–4: $n = 1012$; 43.5% vs. Group 5: $n = 98$; 36.4%; $p = 0.047$). As expected, the participants of the Urogynecology Congress (Group 1) showed the greatest interest compared to the other groups ($p < 0.001$). Participants were aware of the importance of postpartum recovery and 97.4% ($n = 2266$) of the medical professionals and 96.3% ($n = 259$) of the pregnant women would perform exercises for postpartum recovery. Regarding the question of who should provide care for the postpartum recovery, the majority of each group agreed that exercises should be taught by both physiotherapists and midwives (MP $n = 1328$; 57.1% vs. NP $n = 122$; 45.4%); however, 43.5% ($n = 117$) of the pregnant women felt that care by the midwife would be sufficient (MP 23.9%; $n = 555$; $p < 0.001$).

Discussion

Main findings

Regarding our principal findings, the vast majority of both the medical professional groups and the non-professional control group prefers vaginal birth. While there are significant differences both within the professional group and compared to the control group of non-professional pregnant women, the overall percentage of those opting for CS for themselves or their partners is only 6.1%. We feel that this strong statement of patient preference for vaginal delivery provides an important information to guide our policies and strategies to reduce our increasing the CS rates.

Looking at these differences, it is important to determine the specific reasons that health care providers and non-medical professional mothers-to-be have for choosing elective CS.

In our study sample, fetal morbidity was the most important reason to opt for CS in the non-professional control group of pregnant women, whereas concerns about pelvic floor disorders were mentioned in the group of professional health care providers. These differences were significant even though the non-professionals felt comfortable in knowing advantages and disadvantages of either mode of delivery. However, the awareness of pelvic floor disorders is different in these groups, a fact that has to be considered while counselling women antenatally.

Strengths and limitations

The strength of this online questionnaire study is, besides the notable sample-size of anonymous participants, that detailed information has been gained regarding prior experienced births, professional background, and reasons why people may have opted for CS. In addition, some general information about pregnancy and childbirth-associated alterations to the pelvic floor was explained, giving participants the opportunity to gain some novel information while answering the questionnaire. New insights in the interest in risk stratification systems and post-partum pessary therapy might be of great importance for the future of pelvic floor protection.

Our study also has some limitations. Since a validated questionnaire in the German language was and is still not available, an online questionnaire was developed for this study, which was not validated. In addition, the small number of participants in Groups 2–4 could result in a non-representative group sample. However, we know that the average response rate for surveys provided by email is about 10–15%.

Since participants in the lay control group were not asked about their profession, there may have been a bias toward the fact that unidentified medical professionals may have been within the as laity defined control group. In addition, the professional Groups 2 and 3, all employees of both University Hospitals Tuebingen and Heidelberg, Germany, included up to 20.9% of administration personnel, therefore, weakening the definition of medical professionals being health care providers only.

Regarding recruitment, the non-professionals had to be asked personally to participate. There was no option for a digital invitation such as newsletters or mailing lists as done in Groups 1–4. Therefore, the fewer number of participants can be explained by this disadvantage, this had to be considered, when both MP and NP were analyzed.

Unfortunately, there is no way to analyze non-responders. Whether or not they might have had different characteristics, demographics or attitudes remains unclear.

Interpretation

In 1996, Al-Mufti et al. showed that 17% of obstetricians in the UK had a personal preference for an elective CS [13]. Even though several other studies demonstrated lower rates, especially in Scandinavian countries where personal CS preference rates have been described as low as 1.1% in 2004 [14], the heterogeneity of health care providers' personal preferred mode of delivery is significant, even today. Rivo et al. published a survey in 2018 in Argentina, stating that "only 30.4%" of obstetricians would consider an elective CS without medical indications for themselves or their partners [15]. Even though these studies might be difficult to compare due to their individual design, it is important to look for those changes over time.

Our results are in concordance with the study by Lightly et al., who analyzed 242 British obstetricians and gynecologists in 2014 [16]. Out of those, 90% would opt for vaginal delivery, whereas 10% would prefer a CS for themselves.

Between the years 2006 and 2011, the rate of CS of obstetricians was equal to the rate in the population [16].

Decreasing numbers of preferred elective CS by health care providers can be explained by a growing awareness about the relationship between pregnancy and delivery and pelvic floor disorders [9]. Ongoing research has provided specific information that a CS does not necessarily prevent women from suffering pelvic floor disorders in general. An increasing effort of both urogynecologists and obstetricians to complement one another to increase the awareness and knowledge of pelvic floor disorders, and pregnancy and childbirth has led to more insights in recent times [9]. Even if mothers-to-be have detailed information about potential pelvic floor disorders, the system of risk stratification might reassure them to opt for vaginal birth, if the calculated risk is low [9–11].

The system of risk stratification is obviously not new in the field of medicine. The National Cancer Institute Gail model for the prediction of breast cancer is only one important example [17]. And even in obstetrics, the identification of high-risk populations has been well established, especially in the field of prenatal ultrasound diagnostics [18]. However, using large cohorts with long-term prevalences of pelvic floor disorders such as the ProLong dataset and the SwePOP study to set up a risk stratification system regarding the mode of delivery is an extremely important step in a new direction trying to implement pelvic floor protective obstetric pathways [19–21]. There is evidence that women being smaller that 160 cm are at a specifically higher risk for prolapse in their ongoing later life, especially if the newborn has a weight of more than 4 kg. The prevalence of prolapse in women smaller than 160 cm within 20 years increases significantly from 13.4% to 24.2% if the fetal weight is 4 kg and more. (OR 2.06; 95% CI 1.19–3.55) [19]. Additionally, UR-CHOICE takes several variables into account that are briefly described as follows: U, prevalence of urinary incontinence before pregnancy, R, race/ethnicity, C, child bearing started at what age?, H, mothers' height, O, overweight, I inheritance, C, number of children desired, E, estimated fetal weight [11].

It is crucial to provide information about risk stratification for both mothers-to-be and health care providers. The great interest of almost 70% in our study sample participating in such systems shows that the ongoing discussion about the preferred mode of delivery might move the field of research into the right direction.

Another important item of pelvic floor protection deals with the postpartum recovery period. Connective tissue relaxation is one of the alterations women experience in their postpartum period. Industry provides postpartum pessaries to support postpartum recovery [22]. There is an increasing scientific interest to provide evidence regarding this topic. Therefore, the question of whether or not there is an interest in such a postpartum pessary therapy at all might be helpful.

Conclusion

In summary, this is, to our knowledge, the greatest sample of both health care providers and a non-medical professional lay control group that has been asked regarding their own personal preferred mode of delivery. Remarkably low rates of preferred CS might be a promising step in the right direction regarding mode of delivery, and our attempts to decrease CS rates. The personal preference did not negatively affect the attitude towards vaginal birth, at least in our study population. Therefore, high and unsatisfying rates of CS should not be explained by patients' and health care providers' personal preferences. In addition, an increasing awareness of pelvic floor disorders including systems of risk stratification should be a goal of antenatal counselling of our patients. As a practical recommendation, future prevention aspects might include a more detailed education about pelvic floor disorders and research has to combine both obstetrics and urogynecology to improve our patient-centered care.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The Study was approved by the local ethics committee of the University of Tuebingen (Ethic Committee Eberhard-Karls-University Tuebingen, Germany, 91/2017BO2, 02/28/2017)

Informed consent Informed consent was obtained from all individual participants included in the study.

Appendix: Questionnaire

In the appendix we present a translated and combined questionnaire in order not to overload the manuscript. Questions that have been asked medical professionals only have been marked. In the original German language, careful attention had been paid to keep the language understandable for non-professionals. These differences in the language are lost due to the translation process.

DECISION-Study

Personal preference regarding mode of delivery-a prospective, online-based, informative questionnaire Survey

First, we would like to ask a few personal questions:

a. How old are you?

b. What is your gender?

(only asked in the questionnaire for medical professionals)

- ☐ Male
- ☐ Female

c. What is your occupation?

(only asked in the questionnaire for medical professionals)

- ☐ Physician
- ☐ Midwife
- ☐ Midwife in training
- ☐ Medical assistant
- ☐ Nurse
- ☐ Physiotherapist
- ☐ Surgical or anaesthetic technician assistant
- ☐ Management
- ☐ Scientist
- ☐ Facility management
- ☐ Trainee
- ☐ Student
- ☐ Another field: Please specify:

d. In which medical field do you work?

(only asked in the questionnaire for medical professionals)

- ☐ Gynecology
- ☐ Another field: Please specify:

e. If you work in the field of Gynecology, what is your subspecialization?

(only asked in the questionnaire for medical professionals)

- ☐ Urogynecology
- ☐ Obstetrics
- ☐ Another field: Please specify:

f. Are you currently pregnant?

(only asked in the questionnaire for medical professionals)

- ☐ Yes
- ☐ No

g. Do you have children? And if yes, how many?

- ☐ No
- ☐ Yes:

h. What was your experienced mode of delivery?

Select all that apply:

- ☐ Vaginal delivery
- ☐ Vaginal operative delivery (forceps or vacuum)
- ☐ Primary Cesarean section
- ☐ Secondary Cesarean section

i. Do you feel well enough informed about the advantages and disadvantages of a vaginal delivery compared to a C-section? (only asked in the questionnaire for non-professionals)

- ☐ Yes
- ☐ No
- ☐ unsure

Over 20 years ago 282 Obstetricians in the UK were asked about their preferred mode of delivery, assuming an uncomplicated pregnancy. (Al-Mufti 1996) Now we would like to ask the same question.

1. **If you were about to become parents (again), what would be your preferred mode of delivery?**
   - ☐ vaginal
   - ☐ Cesarean section
   - ☐ unsure

2. **If you opted for Cesarean section, please indicate why**

   Select all that apply
   - ☐ In fear of the risk for fetal asphyxia
   - ☐ In fear of pain
   - ☐ In fear of birth injury (e.g. perineal tear)
   - ☐ In fear of an episiotomy
   - ☐ In fear of vaginal operative delivery such as vacuum or forceps
   - ☐ In fear of a secondary C-Section while trying to deliver vaginally
   - ☐ In fear of a restriction on my sexual activity
   - ☐ Because of better predictability
   - ☐ In fear of a pelvic floor disorder such as
     - ○ urinary incontinence
     - ○ faecal incontinence
     - ○ prolapse
   - ☐ Other reasons

3. **The decision regarding mode of delivery:**
   - ☐ Will be my own decision.
   - ☐ Will be a decision between me and my husband/wife.
   - ☐ Should be a joined decision between my obstetrician, midwife and us.
   - ☐ Should be a decision only made by my obstetrician and midwife.
   - ☐ Was already predetermined due to medical reasons. Please specify:
   - ☐ unsure

The previously mentioned study revealed that 17% of the 282 obstetricians opted for Cesarean section (31% of the women and 8% of the men for their partners).

As the main reason for this decision, 80% stated to be afraid of a pelvic floor disorder while 58% feared restriction on sexual activity. The fear for harming the child is only mentioned in third place with 39% of the respondents, while 27% mentioned the better predictability of a C-Section. (Al-Mufti 1996).

Today we know that this was not a representative group. Other surveys indicated lower rates of personal preferred Cesarean section.

One reason to opt for a Cesarean section could be the fear of pain. In this regard there are different options to reduce pain during labour, such as epidural anaesthesia.

Over the last 20 years we have learned much about anatomical and physiological aspects of the female pelvic floor. Today we know more about the effects of pregnancy and delivery on the female pelvic floor, as compared with the time when the UK obstetricians were asked about their preferred mode of delivery. Furthermore, we expect that only a very small group of women is likely to benefit from a Cesarean section due to specific factors, whereas the majority of women are unlikely to have any advantage from a Cesarean section and could safely give birth vaginally.

It is a challenge to identify this small group of women. The procedure for this is called risk-stratification. Different factors such as height, weight, age, estimated fetal weight, genetic factors, prevalence of incontinence and other factors were analysed. There is evidence that women who are less

4. Would you like to have an epidural anaesthesia during labour?

- ☐ Yes
- ☐ No
- ☐ Unsure

5. In case you do not want to have an epidural, what are the reasons for it?

Select all that apply

- ☐ Fear of complications during the application of the epidural
- ☐ I don't like the idea of a needle in my back
- ☐ I don't want to interfere with natural childbirth with an epidural, I am concerned that an epidural may result in a Cesarean section
- ☐ Other reasons. Please specify:

Some information about epidural anaesthesia:

Meanwhile there is a good evidence about epidural anaesthesia. It is effective in pain relief and does not lead to a higher rate of Cesarean sections. First stage of labour might be a little shorter, second stage a little longer, however, this does not bring any negative consequences. Regarding the pelvic floor, there is evidence that epidural anaesthesia has protective effects on both the levator ani muscle and the anal sphincters.

Some facts about a risk-stratification system:

then 160 cm tall while carrying a baby with an estimated fetal weight of more than 4 kg might benefit from a Cesarean section.

The aim of the risk-stratification is to identify pregnant women who will have a measurable benefit from a Cesarean section. Other women could be approved to deliver their child vaginally.This risk-stratification would take place during a visit to your obstetrician where those parameters can be identified. This is an additional visit; however, it is covered by your insurance (at least in Germany).

6. Are your interested to participate in such a risk stratification system?

- ☐ Yes
- ☐ No
- ☐ unsure

Assuming the risk stratification reveals a very low risk for you (or your partner) we would like to ask the same question from the beginning:

7. If you were about to become parents (again), would you prefer your child to be delivered:

- ☐ Vaginally
- ☐ By Cesarean section
- ☐ Unsure

The postpartum period is an important time for pelvic floor recovery. Those exercises are necessary to prevent long term consequences like incontinence or prolapse.

8. For this period, recovery exercises should be taught by

- ☐ Midwife
- ☐ Physiotherapist
- ☐ Both midwife and physiotherapist
- ☐ A trainer is unnecessary as those exercises can be done individually
- ☐ I don't need those exercises
- ☐ Unsure

There is an assumption that a postpartum pessary therapy might support pelvic floor recovery. It contains a ring or cube pessary made of silicone, which is inserted vaginally to decrease tension on the connective tissue of the pelvic floor. There is not much experience regarding this therapy, however, in theory it could be beneficial to the postpartum recovery.

9. Would you be interested in such a pessary therapy?

☐ Yes

☐ No

☐ Unsure

Thank you for your time to participate in our survey!

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