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Gender and role differences of lecturer and student perspectives on sex- and gender-based medicine in the medical curriculum – a cross-sectional survey

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Abstract

Background Sex- and gender-based medicine (SGBM) addresses differences between males/men and females/women with regard to clinical manifestation, diagnostics, treatment and outcomes of diseases. The implementation of SGBM in the medical curriculum varies, and data on the knowledge of lecturers and students about SGBM is scarce. This study aims to evaluate the perceived importance and knowledge of SGBM among lecturers and students.

Methods This cross-sectional observational survey was conducted using a questionnaire, including ranked with a Likert Scale. Statistical analysis was performed with the Chi-squared test. All lecturers and students at the Bern University Medical School in Switzerland were invited to voluntarily participate.

Results 114 (34.1%) lecturers and 903 (41.4%) students participated in the survey. Women perceived education of SGBM to be of greater importance than men in lecturer and student subgroups respectively (lecturers women vs. men median 6.0 vs. 5.0, $P=0.011$; students 6.0 vs. 5.0, $P<0.001$). No significant differences between genders of self-reported knowledge of SGBM were found (lecturers women vs. men median 4.0 vs. 4.0, $P=0.624$; students 3.0 vs. 4.0, $P=0.562$). There were significant differences in the perception of the SGBM being actively addressed in lectures between lecturers and students (59.4% vs. 28.8%, $P<0.001$) and whether the curriculum should include SGBM (strongly agree 28.9% vs. 51.3%, $P<0.001$).

Conclusion Women lecturers and students consider teaching of SGBM during medical studies to be more important than men. Lecturers perceived the amount of SGBM already included in the lectures to be greater compared to students.

Keywords Students, educational personnel, sex, gender identity, education, knowledge

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Background

Sex- and gender-based medicine (SGBM) recognizes that there are substantial differences in diagnosis, treatment and prognosis of various diseases between men and women [1]. Sex is defined by the biological features (sex chromosomes: e.g. XY for male, XX for female) and associated physiological differences of males and females [2, 3]. Clinical studies use sex as a dichotomous concept, consecutively neglecting rare sex chromosomes variants (e.g. intersex) [3]. Gender refers to the socially constructed characteristics of men and women and is influenced by cultural and societal norms and roles, behaviours, and interpersonal relationships [2–4]. Gender is considered a continuous characteristic [5]. Despite these differences, some studies still use the terms sex and gender equivocally [3, 6]. There is a complex interplay between sex and gender throughout an individual's life and both factors independently influence the development of an individuals' health and disease [7–9] – resulting in reconsideration of the 'one-size-fits-all' and a shift towards personalised medicine.

To be able to take into consideration important differences in disease presentation and outcome and allow personalization of treatment decisions, students need to learn how to implement SGBM within clinical decision-making and treatment proposals [10, 11]. Students, whose tutors take the patients' sex and gender into account during their clinical routine, show a greater understanding of SGBM [12]. Collectively, teaching and training of SGBM is increasingly becoming relevant during medical education [13, 14], and societal policies and recommendations are addressing the necessity of this topic [15] (e.g. World Health Organisation [WHO] [16] or American Medical Association [AMA] [17]). Jenkins et al. in their observational survey have showed while 85% of the US medical students were familiar with the concept of SGBM [18], only 35% of them felt prepared to include SGBM in their future healthcare practice [18]. Whilst this reflects the necessity of SGBM within medical curriculum, the rate and quality of implementation into educational programs are institutional dependent due to lack of thorough guidelines. Knowledge of implementation practices in medical education, as well as the perspectives on this topic from students and educators within Central European countries, is sparse.

This study was designed to assess the current state of SGBM at the University of Bern in Switzerland in a cross-sectional survey. The primary aim of our study was to examine if there are any gender differences regarding the importance of teaching SGBM in lecturers and students, respectively. Our secondary aim was to examine whether gender differences exist in the knowledge of SGBM among lecturers and students. We hypothesized that (1) there are gender-specific differences between women and

men lecturers and students regarding the importance of including SGBM into the medical curriculum (2) there are gender differences in self-perceived knowledge of SGBM.

Methods

Study participants

All lecturers teaching in the Bachelor and Master programs of Human Medicine at the University of Bern, Switzerland, were invited to participate. All students enrolled at the Medical School of the University of Bern in September 2022 were also invited to participate. Participation was voluntary. As the study population consisted of lecturers and students matriculated at the Bern Medical School (inclusion criteria for participation) there was no sampling technique. Exclusion criteria was the unwillingness to participate in the study. According to national regulations no ethical board request was required. Reporting of this observational study was undertaken in accordance with the STROBE guidelines [19] and checklist (Supplemental Material Table 1).

Survey

For the present cross-sectional observational study, a survey was created (in German) for lecturers and students, respectively (Supplemental Material Tables 2 and 3). The lecturers' 30-question survey was based on a previous German survey study from Busch et al. [20] and was used in an adapted form. The students' 21-question survey was based on a questionnaire from Jenkins et al. [18] and was revised with the author's permission.

Each question was structured with five different answer designs: (1) specific selection (2), yes/no (3), multiple choice (4), free-text and (5) scaled entry. The scaled entry contained the six-point Likert Scale (1=strongly disagree, 2=disagree, 3=rather disagree, 4=rather agree, 5=agree, 6=strongly agree). The questionnaires entailed four topic areas: (1) participant demographics (2), current extent of SGBM in an individual lecture (3), knowledge and importance of SGBM and (4) attitude to future implementation of SGBM in the medical curriculum. The lecturers' field of specialty were grouped into five main areas: 'surgical', 'internal medicine', 'pediatrics', 'preclinical and research' and 'other clinical specialties'.

Data collection

The survey was sent out via institutional e-mails to all lecturers and students using evasys (©evasys GmbH, Lüneburg, Germany) on the 20th of September 2022. The applicability of the surveys components and the technological tool has been shown previously elsewhere [18, 20, 21]. Two reminder emails were sent separately at approximately ten days and at three weeks after the initial invitation. Completing the survey was on voluntary basis and

the responses were anonymized. The survey was without any restrictive measures if no answers were given.

Statistical analysis

Categorical variables were reported as numbers and percentages. As >95% of self-reported gender was either man or woman, a dichotomization of reported gender within the text was undertaken. To facilitate comparison between dichotomised groups (self-reported men/women), equal stepwise Likert Scale responses were assumed and medians (with interquartile ranges [IQR]) were compared using Pearson's Chi-squared test. A *p*-value of 0.05 or less was considered statistically significant. Data was visualized using violin plots. Statistical analyses and data visualization was performed using R software (©R Foundation for Statistical Computing, Vienna, Austria) with R Studio software (©R Studio, Inc, Boston, MA).

Results

Overall, 334 lecturers and 2,184 students were contacted. The response rate of the lecturers and students was 34.1% (*n*=114 of 334) and 41.4% (*n*=903 of 2,184), respectively (CONSORT flow diagram in Supplemental Fig. 1).

Lecturer demographics

Self-reported gender included 40 (35.1%) women, 72 (63.2%) men and 2 (1.7%) did not specify (Supplemental Material Table 4). A total of 80 (70.2%) lecturers worked in clinics. 101 (56.7%) lecturers taught in clinical years three to five. Women worked predominantly in pediatrics (*n*=11, 27.5%) or preclinical and research (*n*=9, 22.5%). Men reported working in surgical fields (*n*=19, 26.4%) or internal medicine (*n*=16, 22.2%).

SGBM: the lecturers' view

Men compared to women considered SGBM during medical education to be significantly less important (men 5.0 'agree' [IQR 4.0–6.0] vs. women 6.0 'strongly agree' [IQR 5.0–6.0], *P*=0.011) (Fig. 1 and Supplemental Material Tables 5 and 6). No significant disparity was found regarding their self-perceived knowledge of SGBM (men 4.0 'rather agree' [IQR 3.0–4.5] vs. women 4.0 'rather agree' [IQR 3.0–5.0], *P*=0.62).

No gender-related differences across the lecturers' own field of specialization and the importance of SGBM (e.g. 'strongly agree' men 22.2% (*n*=16 of 72) vs. women 37.5% (*n*=15 of 40), *P*=0.51) and the knowledge of SGBM (e.g. 'strongly agree' men 16.7% (*n*=12 of 72) vs. women 20.0% (*n*=8 of 40), *P*=0.94) were found (Table 1). The distribution across the response scale was not significantly different between medical specialties with regard to responses on the importance of SGBM (e.g. 'strongly agree' surgical 24.0% (*n*=6 of 25) vs. internal medicine 41.6% (*n*=10

of 24), *P*=0.24) and knowledge of SGBM (e.g. 'strongly agree' surgical 8.0% (*n*=2 of 25) vs. internal medicine 25.0% (*n*=6 of 24), *P*=0.49) (Table 1).

Most lecturers agreed or strongly agreed that they would like to increase their current knowledge of SGBM in further education ('agree' or 'strongly agree': 51.8% (*n*=59 of 114)) (Supplemental Material Table 5). Furthermore, most agreed to increase the SGBM-related content in their respective lectures ('agree' or 'strongly agree' 54.4% (*n*=62 of 114)). Lecturers stated SGBM should be taught in compulsory lectures (30.7% (*n*=71 of 231)) or as problem-based learning sessions (29.9% (*n*=69 of 231)). A significant higher proportion of women stated SGBM should be included from the beginning of the medical studies (women 70.0% (*n*=28 of 40) vs. men 45.8% (*n*=33 of 72), *P*=0.07). More women 'agreed' or 'strongly agreed' on the importance of a uniform implementation of SGBM (women 72.5% (*n*=29 of 40) vs men 54.2% (*n*=30 of 72), *P*=0.07).

Student demographics

Self-reported gender in students included 625 (69.2%) women, 270 (29.9%) men, 3 (0.3%) other and 5 (0.6%) did not specify (Supplemental Material Table 5). 798 (88.4%) participants stated to be single. The student distribution according to the year of studies was: year one (*n*=206, 22.8%), year two (*n*=168, 18.6%), year three (*n*=116, 12.8%), year four (*n*=141, 15.6%), year five (*n*=100, 11.1%) and year six (*n*=172, 19.1%). Student gender was evenly distributed across the years (*P*=0.78).

SGBM: the student's view

There was a significant difference between men and women students regarding their perception of the importance of teaching SGBM during medical education (men 5.0 'agree' [IQR 4.0–6.0] vs. women 6.0 'strongly agree' [IQR 5.0–6.0], *P*<0.001) (Fig. 1; Table 2). There was no significant difference in self-perceived knowledge of SGBM (men 4.0 'rather agree' [IQR 2.0–4.0] vs. women 3.0 'rather disagree' [IQR 3.0–4.0], *P*=0.56). The distribution across the response scale was significantly different between the study years for the perceived importance of SGBM (e.g. 'strongly agree' year one 45.1% (*n*=93 of 206) vs year four 62.2% (*n*=87 of 140) vs. year six 43.0% (*n*=74 of 172), *P*=0.020) (Supplemental Material Table 9). There was a significant difference across six study years of the perceived knowledge of SGBM (e.g. 'strongly agree' year one 2.9% (*n*=6 of 206) vs. year four 3.6% (*n*=5 of 140) vs. year six 5.2% (*n*=9 of 172), *P*<0.001) (Supplemental Material Table 9).

Comparing lecturers and students

No significant difference was observed between lecturers and students for the importance of teaching SGBM

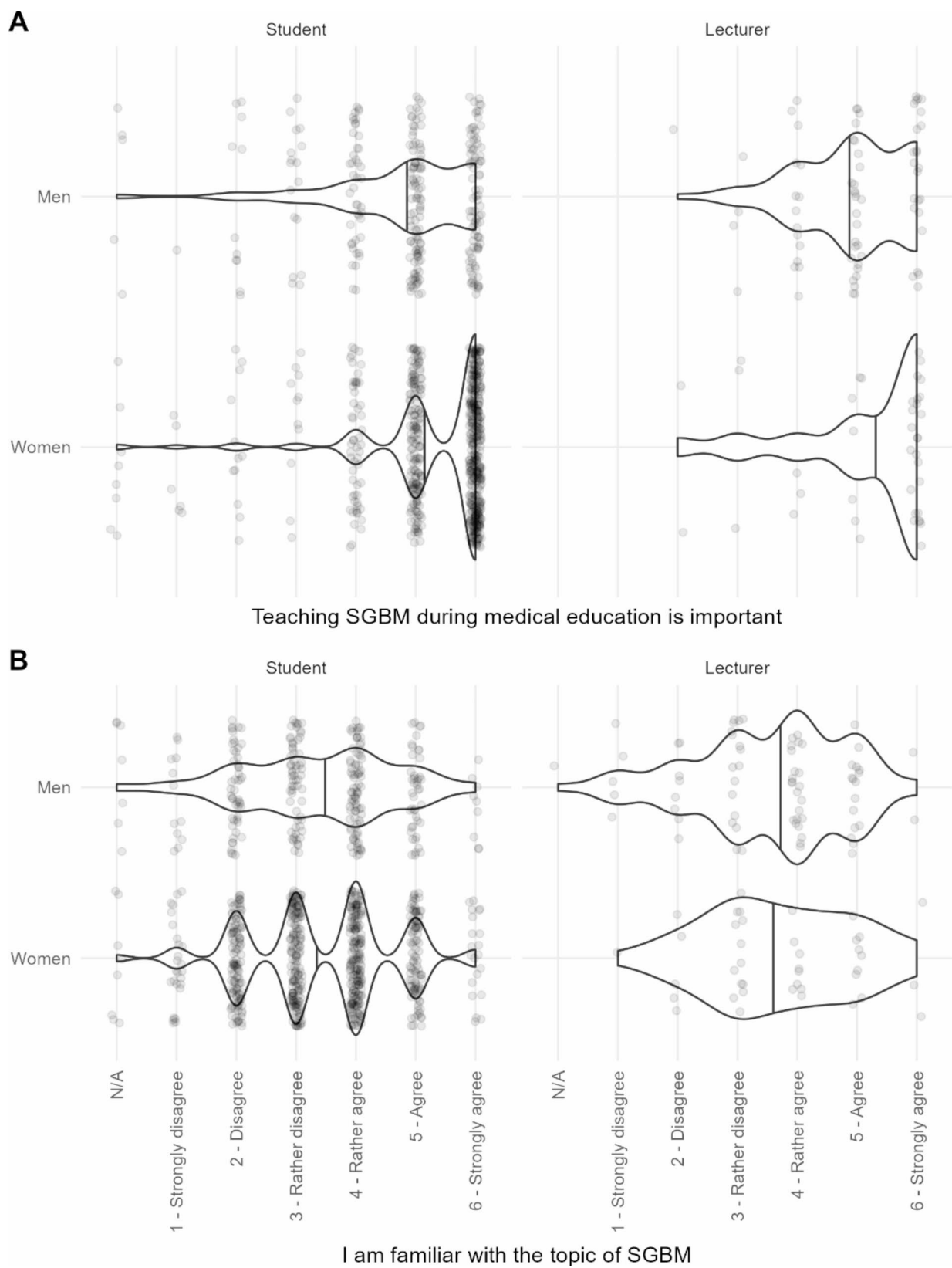


Fig. 1 Perceived importance and knowledge of sex- and gender-based medicine in students and lecturers. Violin plot showing density of responded questions as determined by the Likert Scale. Vertical line representing median values for each group respectively; Abbreviations: N/A, no answer; SGBM, sex- and gender-based medicine

Table 1 Perceived importance and knowledge of sex- and gender-based medicine in the lecturers' field of specialty

	Strongly disagree	Disagree	Rather disagree	Rather agree	Agree	Strongly agree	N/A	p-value [†]
Teaching SGBM in my field of specialty is important								
Total (N = 114*)	2 (1.7)	14 (12.3)	13 (11.4)	27 (23.7)	26 (22.8)	31 (27.2)	1 (0.9)	
<i>By gender</i>								
Women (n = 40)	0 (0.0)	6 (15.0)	4 (10.0)	8 (20.0)	7 (17.5)	15 (37.5)	0 (0.0)	0.511
Men (n = 72)	2 (2.8)	8 (11.1)	8 (11.1)	19 (26.4)	18 (25.0)	16 (22.2)	1 (1.4)	
<i>By field of specialty</i>								
Surgical (n = 25)	0 (0.0)	5 (20.0)	1 (4.0)	8 (32.0)	4 (16.0)	6 (24.0)	1 (4.0)	0.242
Internal medicine (n = 24)	0 (0.0)	0 (0.0)	3 (12.5)	4 (16.7)	7 (29.2)	10 (41.6)	0 (0.0)	
Pediatrics (n = 17)	0 (0.0)	3 (17.6)	2 (11.8)	2 (11.8)	7 (41.2)	3 (17.6)	0 (0.0)	
Preclinical and research (n = 21)	2 (9.5)	3 (14.3)	2 (9.5)	5 (23.8)	2 (9.5)	7 (33.4)	0 (0.0)	
Other clinical specialties (n = 20)	0 (0.0)	2 (10.0)	3 (15.0)	6 (30.0)	5 (25.0)	4 (20.0)	0 (0.0)	
I am familiar with the topic of SGBM in my field of specialty								
Total (N = 114*)	4 (3.5)	8 (7.0)	16 (14.0)	29 (25.5)	35 (30.7)	21 (18.4)	1 (0.9)	
<i>By gender</i>								
Women (n = 40)	2 (5.0)	2 (5.0)	6 (15.0)	11 (27.5)	11 (27.5)	8 (20.0)	0 (0.0)	0.943
Men (n = 72)	2 (2.8)	6 (8.3)	10 (13.9)	18 (25.0)	23 (31.9)	12 (16.7)	1 (1.4)	
<i>By field of specialty</i>								
Surgical (n = 25)	2 (8.0)	2 (8.0)	4 (16.0)	6 (24.0)	8 (32.0)	2 (8.0)	1 (4.0)	0.493
Internal medicine (n = 24)	0 (0.0)	4 (16.7)	3 (12.5)	5 (20.8)	6 (25.0)	6 (25.0)	0 (0.0)	
Pediatrics (n = 17)	1 (5.9)	0 (0.0)	5 (29.4)	3 (17.6)	7 (41.2)	1 (5.9)	0 (0.0)	
Preclinical and research (n = 21)	1 (4.8)	2 (9.5)	1 (4.8)	6 (28.6)	5 (23.7)	6 (28.6)	0 (0.0)	
Other clinical specialties (n = 20)	0 (0.0)	0 (0.0)	3 (15.0)	7 (35.0)	6 (30.0)	4 (20.0)	0 (0.0)	

Variables and are given as numbers (percentages)

Abbreviations: N/A, no answer; SGBM, sex- and gender-based medicine; *'Total' includes 40 women, 72 men and 2 no answer to gender; [†]Pearson's Chi-squared test comparing women and men and field of specialty

(lecturers 5.0 'agree' [IQR 4.5–6.0] vs. students 6.0 'strongly agree' [IQR 5.0–6.0], $P=0.16$) (Table 3). There was no significant difference in the self-reported knowledge of SGBM between the lecturers' and students' cohort (lecturers 4.0 'rather agree' [IQR 3.0–5.0] vs. students 4.0 'rather agree' [IQR 3.0–4.0], $P=0.39$).

The proportion of incorporated SGBM in lectures was reported significantly different between students and lecturers (e.g. 'barely incorporated' students 52.7% ($n=323$ of 906) vs. lecturers 18.3% ($n=11$ of 114), $P<0.001$), actively addressing SGBM in lectures (students 28.8% ($n=191$ of 906) vs. lecturers 59.4% ($n=38$ of 114), $P<0.001$), SGBM being part of the exams (e.g. 'yes always' students 1.9% ($n=17$ of 906) vs. lecturers 10.0% ($n=6$ of

114), $P<0.001$) (Table 3). A further difference was found for the consideration if SGBM should be included in the curriculum (e.g. 'strongly agree' students 51.3% ($n=465$ of 906) vs. lecturers 28.9% ($n=33$ of 114), $P<0.001$) and a desired introduction to SGBM (e.g. 'strongly agree' students 51.3% ($n=465$ of 906) vs. lecturers 28.9% ($n=33$ of 114), $P<0.001$). No statistically significant difference was found between lecturers and students with regard to SGBM improving one's ability to manage patients (e.g. 'strongly agree' students 58.4% ($n=529$ of 906) vs. lecturers 43.8% ($n=50$ of 114), $P=0.06$). Overall, 78.0% ($n=707$ of 906) of students and 64.0% ($n=73$ of 114) of lecturers 'agree' or 'strongly agree' that SGBM should be part of the curriculum ($P<0.001$). Student awareness regarding

Table 2 Perceived importance and knowledge of sex- and gender-based medicine in students

	Strongly disagree	Disagree	Rather disagree	Rather agree	Agree	Strongly agree	N/A	p-value [†]
Teaching SGBM during medical education is important								
Total (N=903*)	8 (0.9)	24 (2.7)	29 (3.2)	100 (11.1)	270 (29.9)	458 (50.7)	14 (1.5)	
<i>By gender</i>								
Women (n=625)	6 (1.0)	12 (1.9)	11 (1.8)	56 (9.0)	166 (26.5)	366 (58.5)	8 (1.3)	<0.001
Men (n=270)	1 (0.4)	11 (4.1)	17 (6.3)	44 (16.3)	102 (37.8)	90 (33.3)	5 (1.8)	
I am familiar with the topic of SGBM								
Total (N=903 [†])	38 (4.2)	168 (18.6)	227 (25.1)	278 (30.8)	146 (16.2)	31 (3.4)	15 (1.7)	
<i>By gender</i>								
Women (n=625)	26 (4.2)	117 (18.7)	163 (26.1)	190 (30.4)	100 (16.0)	21 (3.3)	8 (1.3)	0.562
Men (n=270)	12 (4.5)	51 (18.9)	63 (23.3)	84 (31.1)	44 (16.3)	9 (3.3)	7 (2.6)	

Variables are given as numbers (percentages)

Abbreviations: N/A, no answer; SGBM, sex- and gender-based medicine; *Total includes 625 women, 270 men, 3 other and 5 no answer to gender; [†]Pearson's Chi-squared test, comparing women and men

the integration of SGBM in twelve clinical areas during medical education was significantly different in eight clinical areas across years one to six among men and women (e.g. clinical depression: 'yes to integration' men 45.9% (n=124 of 270) vs. women 36.6% (n=229 of 625), $P<0.001$) (Supplemental Material Table 8).

Discussion

In this Central European survey study, we assessed both lecturers' and students' perceptions of SGBM within medical education. Lecturers and students, predominantly women, acknowledge the importance of teaching SGBM during medical education (lecturers women 6.0 'strongly agree' vs. men 5.0 'agree', $P=0.011$; students women 6.0 'strongly agree' vs. men 5.0 'agree', $P<0.001$). The overall self-perceived knowledge of SGBM remains moderate, independent of status (lecturers 4.0 'rather agree' vs. students 4.0 'rather agree', $P=0.39$). In comparison to lecturers, students report a lack of SGBM in lectures ('actively addressing SGBM' lecturers 59.4% (n=38 of 114) vs. students 28.8% (n=191 of 906), $P<0.001$). The divergence in the incorporation of SGBM observed among students and lecturers suggests a misalignment in perceptions and practices. Students feel that SGBM integration is still lagging behind their expectations, while lecturers' general perception is that relevant incorporation is already being done. Bridging these gaps is crucial for creating an inclusive educational environment, where scholarly expectations and lecturer's perceptions meet up, to allow for the necessary integration of SGBM throughout the medical curriculum.

Women lecturers and students perceive teaching SGBM during medical education to be significantly more important than their men colleagues (women lecturers

6.0 'strongly agree' vs. men 5.0 'agree', $P=0.01$; women students 6.0 'strongly agree' vs. men 5.0 'agree', $P<0.001$). Along the same line, Dhawan et al. described that female physician trainees more often consider SGBM to be important and feel that it is not sufficiently discussed in clinical training (female 80% vs male 65%, no p -value given) [22]. They also take the patient's gender into account when treating them ('sometimes' to 'very often': female 95% vs. male 65%, no P -value given) [22]. Risberg and colleagues noted a non-significant trend, with more women than men (76% vs. 66%, $P=0.06$) agreeing on the importance of considering patients' gender during consultations [23]. Interestingly, their subgroup analysis identified men surgeons to rate the importance of gender to a lesser extent than men in non-surgical specialties (OR 2.1; 95%CI 1.0,4.2) or men family physicians (OR 3.2; 95%CI 1.1,8.8) [23]. In our study, a significant higher percentage of men lecturers are active in surgical fields, women are more represented in non-surgical fields (e.g. surgical fields men 26.4% (n=19 of 72) vs. women 15.0% (n=6 of 40), $P=0.03$). However, our results did not show a difference in the rating of the importance, nor the amount of knowledge of SGBM, when comparing different genders and specialties (e.g. 'strongly agree' importance men 22.2% (n=16 of 72) vs women 37.5% (n=15 of 40), $P=0.51$, surgical 24.0% (n=6 of 25) vs. internal medicine 41.6% (n=10 of 24), $P=0.24$; knowledge men 16.7% (n=12 of 72) vs. women 20.0% (n=8 of 40), $P=0.94$, surgical 8.0% (n=2 of 25) vs. internal medicine 25.0% (n=6 of 24), $P=0.49$).

Our results indicate that most students (n=728 of 903, 80.6%) 'agree' or 'strongly agree' with the importance of teaching SGBM during medical education. This echoes existing findings from Jenkins et al., where an average of

Table 3 Lecturers' and students' perception of sex- and gender-based medicine in medical education

	Total (N = 1020)	Lecturers (n = 114)	Students (n = 906)	p-value †
Teaching SGBM during medical education is important				
Strongly disagree	8 (0.8)	0 (0.0)	8 (0.9)	0.157
Disagree	28 (2.7)	4 (3.5)	24 (2.6)	
Rather disagree	36 (3.5)	7 (6.2)	29 (3.2)	
Rather agree	119 (11.7)	19 (16.6)	100 (11.0)	
Agree	306 (30.0)	35 (30.7)	271 (29.9)	
Strongly agree	507 (49.7)	49 (43.0)	458 (50.6)	
N/A	16 (1.6)	0 (0.0)	16 (1.8)	
I am familiar with the topic of SGBM				
Strongly disagree	44 (4.3)	6 (5.2)	38 (4.2)	0.391
Disagree	181 (17.7)	13 (11.4)	168 (18.5)	
Rather disagree	258 (25.3)	30 (26.3)	228 (25.2)	
Rather agree	311 (30.5)	33 (29.0)	278 (30.7)	
Agree	172 (16.9)	26 (22.8)	146 (16.1)	
Strongly agree	36 (3.5)	5 (4.4)	31 (3.4)	
N/A	18 (1.8)	1 (0.9)	17 (1.9)	
Does your faculty have a designated curriculum for SGBM?				
Yes	95 (9.3)	14 (12.3)	81 (8.9)	0.042
No	369 (36.2)	29 (25.4)	340 (37.6)	
Not sure	508 (49.8)	63 (55.3)	445 (49.1)	
N/A	48 (4.7)	8 (7.0)	40 (4.4)	
Does your curriculum include lectures or programs on SGBM?				
Yes	392 (38.4)	39 (34.2)	353 (38.9)	0.002
No	321 (31.5)	53 (46.5)	268 (29.6)	
Not sure	270 (26.5)	20 (17.5)	250 (27.6)	
N/A	37 (3.6)	2 (1.8)	35 (3.9)	
How big is the proportion of SGBM in the lectures?‡				
Barely (1–2 sentences)	334 (49.6)	11 (18.3)	323 (52.7)	<0.001
Little (1–2 slides)	161 (23.9)	27 (45.0)	134 (21.8)	
Medium (several slides)	49 (7.3)	13 (21.7)	36 (5.9)	
A lot (half of the lecture)	7 (1.1)	2 (3.3)	5 (0.8)	
Very much (whole lecture)	23 (3.4)	4 (6.7)	19 (3.1)	
N/A	99 (14.7)	3 (5.0)	96 (15.7)	
How are SGBM aspects covered in lectures?‡				
Short reference at the beginning of the lecture	126 (17.3)	1 (1.6)	125 (18.9)	0.002
Reference to SGBM literature	41 (5.7)	7 (10.9)	34 (5.1)	0.06
Actively addressing SGBM in lectures	229 (31.5)	38 (59.4)	191 (28.8)	<0.001
Other	118 (16.2)	11 (17.2)	107 (16.1)	
N/A	213 (29.3)	7 (10.9)	206 (31.1)	
Is SGBM part of the exam material?‡				
Yes, always	23 (2.5)	6 (10.0)	17 (1.9)	<0.001
Yes, often	93 (9.9)	11 (18.3)	82 (9.3)	
Yes, occasionally	206 (22.0)	7 (11.7)	199 (22.7)	
Yes, rarely	344 (36.6)	20 (33.3)	324 (36.9)	
No	252 (26.8)	10 (16.7)	242 (27.5)	
N/A	19 (2.0)	4 (6.7)	15 (1.7)	
I do not take exams	2 (0.2)	2 (3.3)	0 (0.0)	
Medical education should include the teaching of SGBM				

Table 3 (continued)

	Total (N = 1020)	Lecturers (n = 114)	Students (n = 906)	p-value [†]
Strongly disagree	9 (0.9)	0 (0.0)	9 (1.0)	< 0.001
Disagree	24 (2.4)	8 (7.0)	16 (1.8)	
Rather disagree	44 (4.3)	6 (5.3)	38 (4.2)	
Rather agree	140 (13.7)	24 (21.1)	116 (12.8)	
Agree	282 (27.6)	40 (35.1)	242 (26.7)	
Strongly agree	498 (48.8)	33 (28.9)	465 (51.3)	
N/A	23 (2.3)	3 (2.6)	20 (2.2)	
A general introduction to SGBM is desirable.				
Strongly disagree	9 (0.9)	0 (0.0)	9 (1.0)	< 0.001
Disagree	24 (2.4)	8 (7.0)	16 (1.8)	
Rather disagree	44 (4.3)	6 (5.3)	38 (4.2)	
Rather agree	140 (13.7)	24 (21.1)	116 (12.8)	
Agree	282 (27.7)	40 (35.1)	242 (26.7)	
Strongly agree	498 (48.8)	33 (28.9)	465 (51.3)	
N/A	23 (2.2)	3 (2.6)	20 (2.2)	
Knowledge of SGBM improves one's ability to manage patients.				
Strongly disagree	9 (0.9)	1 (0.9)	8 (0.9)	0.064
Disagree	17 (1.7)	5 (4.4)	12 (1.3)	
Rather disagree	29 (2.8)	5 (4.4)	24 (2.7)	
Rather agree	101 (9.9)	13 (11.4)	88 (9.7)	
Agree	251 (24.6)	30 (26.3)	221 (24.3)	
Strongly agree	579 (56.8)	50 (43.8)	529 (58.4)	
N/A	34 (3.3)	10 (8.8)	24 (2.7)	

Variables and are given as numbers (percentages)

Abbreviations: N/A, no answer; SGBM, sex- and gender-based medicine; *Total differs because only participants who responded yes whether the curriculum included lectures on SGBM were asked to answer the question; †Pearson's Chi-squared test, comparing students and teachers

94.2% of students in years one to four (strongly) agreed on the importance of implementing SGBM [18]. We also stratified the importance of SGBM by student gender, with women rating it significantly more highly (women students 6.0 'strongly agree' vs. men 5.0 'agree', $P < 0.001$). To our knowledge, no previous studies have identified differences in the perceived importance of teaching SGBM between men and women students. Several studies have explored gender awareness in students, focusing on gender sensitivity (the ability to recognize gender issues in health care and integrate these into the daily clinical routine) and gender stereotypes [12, 24–26]. Italian women students showed a significantly higher gender sensitivity than men [12], with Swedish, Dutch and Swiss men students being more often caught in the typical gender role ideologies (e.g. "male patients are less demanding than female patients" or "male physicians are more efficient than female physicians") [24, 25].

Interestingly, there were no significant differences in our study regarding self-perceived knowledge of SGBM among men and women lecturers and students (lecturer women vs. men 4.0 'rather agree' vs. 4.0 'rather agree', $P = 0.62$; students 3.0 'rather disagree' vs. 4.0 'rather agree', $P = 0.56$). Acknowledgment of the importance of SGBM was thus not associated with an increased self-reported knowledge of SGBM. Looking at undergraduate students

in economics, showed that men had a higher level of overconfidence (overestimation of one's own abilities) than women [27], which might partially explain our results.

There was a discrepancy among lecturers and students with regard to the perception of how much SGBM is currently being taught in the medical curriculum. Students described a lack of SGBM integration in lectures and exams and would like a more in-depth implementation of SGBM (e.g. 'barely integrated' students 52.7% ($n = 323$ of 906) vs. lecturers 18.3% ($n = 11$ of 114), $P < 0.001$; e.g. 'always in exams' 1.9% ($n = 17$ of 906) vs. 10.0% ($n = 6$ of 114), $P < 0.001$). Lecturers, however, felt they were already quite effective in implementing SGBM in their lectures, actively addressing SGBM aspects (lecturers 59.4% ($n = 39$ of 114) vs. students 28.8% ($n = 191$ of 906), $P < 0.001$).

Our survey highlights the willingness of Swiss students and lecturers to acquire more knowledge on SGBM, emphasizing its importance in future clinical and scientific areas. Given its significance, early introduction of SGBM in the medical curriculum is imperative. Raising awareness of the significance of SGBM amongst lecturers is one of the first steps needed to increase SGBM in the current medical curriculum. However, such an implementation is challenging and requires dedicated efforts over time [28].

If and how the statistical differences translate into relevant differences for the (future) treatment of patients, was beyond the scope of this survey. A particular strength of this study was incorporating both students' and lecturers' point of view with a response rate of 41.4% for students and 34.1% for lecturers. However, a nonresponse bias cannot be excluded. Participants' gender was asked at the start of the survey, possibly increasing their attentiveness to gender-related questions and thus leading to a potential question order bias. Answering the question on self-perceived knowledge of SGBM, was subjective and no objective testing of the knowledge was performed. Furthermore, the expansion of the survey with knowledge questions might have led to survey fatigue, potentially reducing the number of respondents.

Conclusions

Women considered teaching of SGBM during medical education significantly more important than men. There was no difference in the self-reported knowledge of SGBM between genders in both groups, lecturers and students. The dual focus on meeting students (currently unmet) expectations, and ensuring accountability for intervention impact, is crucial for adapting educational practices and policies, serving the scholarly needs of both lecturers and students.

Abbreviations

CI	Confidence interval
e.g.	Exempli gratia
IQR	Interquartile range
N/A	No answer
SGBM	Sex- and gender-based medicine

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12909-024-06252-x>.

Supplementary Material 1: Supplemental Material Table 1. STROBE Statement—Checklist of items that should be included in reports of cross-sectional studies. This checklist was downloaded from <https://www.equator-network.org/reporting-guidelines/strobe/>. Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org. **Supplemental Material Table 2.** Lecturers' questionnaire. Survey originally in German, English translation in italic for publication. **Supplemental Material Table 3.** Students' questionnaire. Survey originally in German, English translation in italic for publication. **Supplemental Material Fig. 1.** CONSORT flow diagram. **Supplemental Material Table 4.** Lecturer demographics stratified by self-reported gender. Variables are given as numbers (percentages). **Supplemental Material Table 5.** Lecturers' perception on future implementation of sex- and gender-based medicine in medical school. Abbreviations: N/A, no answer; *Total' includes 40 women, 72 men and 2 no answer to gender; †Pearson's Chi-squared test, comparing women and men. **Supplemental Material Table 6.** Perceived importance and knowledge of sex- and gender based medicine in lecturers. Variables are given

as numbers (percentages). Abbreviations: N/A, no answer; SGBM, sex- and gender-based medicine; *Total' includes 40 women, 72 men and 2 no answer to gender; †Pearson's Chi-squared test, comparing women and men. **Supplemental Material Table 7.** Student demographics stratified by self-reported gender. Variables are given as numbers (percentages). Abbreviations: N/A, no answer; *Total' includes 625 women, 270 men, 3 other and 5 no answer to gender; †Pearson's Chi-squared test, comparing women and men. **Supplemental Material Table 8.** Student awareness regarding the integration of evidence-based health differences in medical education. Variables are given as numbers (percentages). Abbreviations: N/A, no answer; *Total' includes 625 women, 270 men, 3 other and 5 no answer to gender; †Pearson's Chi-squared test comparing women and men and study years. **Supplemental Material Table 9.** Perceived importance and knowledge of sex- and gender-based medicine in students stratified by study year. Variables are given as numbers (percentages). Abbreviations: N/A, no answer; SGBM, sex- and gender-based medicine; †Pearson's Chi-squared test comparing study years of students.

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Author contributions

study design: LZ, BÖ, CTJM, VMB; literature review: LZ; data collection: LZ, VMB; data analysis: CTJM; data interpretation: all authors; writing: LZ, CTJM; critical revision: all authors.

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Data availability

The datasets used and/or analysed during the current study are available from the corresponding author upon request.

Declarations

Ethics approval and consent to participate

The institutional review board (Cantonal Ethics Committee of Bern, Switzerland) declared this study to not be in need of ethical approval, as it was not subject to the Swiss Human Research Act. The consent to participate was waived by the Cantonal Ethics Committee of Bern, Switzerland. The 1964 Helsinki declaration and its later amendments and comparable ethical standards were obeyed. There were no animal studies performed by any of the authors for this study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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