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Title page

European anesthesiologists' experiences with gender-based mistreatment in the workplace: a secondary multilevel regression analysis

Joana Berger-Estilita M.D. Ph.D.[1,2,3]; Luana Fritsche MM[4]; Kariem El-Boghdadly M.D. Ph.D.[5]; Claudia Camila Dias Ph.D.[3,6]; Marko Zdravkovic M.D. Ph.D.[7,8]

[1]Institute of Anesthesiology and Intensive Care, Salemspital, Hirslanden Medical Group, Schänzlistrasse 39, 3013 Bern, Switzerland

[2]Institute for Medical Education, University of Bern, Mittelstrasse 43, 3012 Bern, Switzerland

[3]CINTESIS@RISE, Centre for Health Technology and Services Research, Faculty of Medicine, University of Porto, Rua Dr. Plácido da Costa, s/n 4200-450, Porto, Portugal

[4] Medical Faculty, University of Bern, Murtenstrasse 11, 3008 Bern, Switzerland

[5]Department of Anaesthesia, Guy's and St Thomas' NHS Foundation Trust, Westminster Bridge Rd, London SE1 7EH, UK

[6]Knowledge Management Unit and Department of Community Medicine, Information and Health Decision Sciences (MEDCIDS), Faculty of Medicine of the University of Porto (FMUP), Alameda Prof. Hernâni Monteiro, 4200-319 Porto, Portugal

[7]Faculty of Medicine, University of Ljubljana, Vrazov trg 2, 1000 Ljubljana, Slovenia

[8]Department of Anesthesiology, Intensive Care and Pain Management, University Medical Centre Maribor, Ljubljanska ulica 5, 2000 Maribor, Slovenia

Running title: Gender Mistreatment in Anesthesiology

Corresponding author:

Joana Berger-Estilita

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Institute of Anesthesiology and Intensive Care, Salemspital, Hirslanden Medical Group,

Schänzlistrasse 39, 3013, Bern, Switzerland

Phone: +41313378045; joanamberger@gmail.com

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1 **European anesthesiologists' experiences with gender-based mistreatment in the workplace: a secondary multilevel regression analysis**

2

3 **Running title:** Gender Mistreatment in Anesthesiology

4

5 **Abstract**

6 **Background:** Workplace gender-based mistreatment (GBM) refers to negative or harmful behaviors

7 directed towards employees. In healthcare settings, this can lead to job dissatisfaction and

8 underperformance and potentially compromise patient outcomes. The aim of this study was to

9 examine workplace GBM among European anesthesiologists and produce the first European Gender-

10 based Mistreatment Rank in Anesthesiology.

11 **Methods:** We conducted a secondary analysis from a worldwide cross-sectional survey database

12 consisting of a 46-item questionnaire exploring, among other outcomes, gender bias attributable to

13 workplace attitudes. The survey completion rate was 80.8%. All respondents were selected from

14 European countries. Associations between mistreatment and the remaining variables were analyzed

15 using univariate and multivariate logistic regression analyses. A generalized linear mixed model was

16 then used to quantify the impact of mistreatment in each European country. Statistical significance

17 was set at $P < 0.05$.

18 **Results:** This study included 5,795 respondents from 43 European countries. The independent

19 predictors of GBM were as follows: female gender, younger age, perceiving gender as a disadvantage

20 for leadership, and perceiving gender as a disadvantage for research. The full model was statistically

21 significant, indicating an ability to distinguish between those who experienced GBM and those who

22 did not ($P < 0.001$). Thus, 26 European countries were ranked based on the prevalence of mistreatment,

23 with Italy showing the best performance (lowest prevalence).

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1 **Conclusions:** The aim of our study was to provide preliminary insight into GBM in anesthesiology
2 in Europe, function as a key benchmark for gender equity, and chart the evolution of disparities
3 over time.

4 **Keywords:** Anesthesiology; Gender bias; Gender equity; Occupational stress; Perceived
5 discrimination; Working conditions; Workplace violence.

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Introduction

The values espoused by an institution and the social support it provides are key determinants of employees' level of engagement [1]. Workplace gender-based mistreatment (GBM) refers to any negative or harmful behavior directed towards an employee in a workplace setting [2]. GBM can take many different forms, including discrimination, abuse, and harassment. The presence of GBM in a healthcare setting can create a hostile work environment that may lead to job dissatisfaction and underperformance, potentially compromising patient outcomes and leading to burnout, depression, and other poor psychological outcomes, such as suicidality [3-7].

Rates of GBM vary among physicians, with studies reporting rates of harassment ranging from 18% to 50% [3,8], depending on the source within the healthcare setting. Current literature indicates that GBM is particularly common among surgical specialties, specifically among female surgeons and surgical residents [3,8-10]. Given that anesthesia is recognized as a high-stress medical specialty mainly due to a lack of control over the working schedule; poor interpersonal professional relationships; and poor recognition by surgical colleagues, the general public, and the media [11], it would be reasonable to assume that these issues also exist in the anesthesia community.

Indeed, prior research has established that GBM occurs in the workplace for anesthesiologists [12-14]. Sources of GBM among anesthesiologists include colleagues, surgeons, patients, visitors, and supervising physicians [3,14]. A recent survey demonstrated that female anesthesiologists perceived the attitudes of coworkers (including surgeons, patients, nurses, and other anesthesiology colleagues) towards them to be worse than those perceived by male anesthesiologists [14]. The odds being mistreated in the workplace was 10.6 times greater for female anesthesiologists than for male anesthesiologists, and women chose to report GBM in only 24% of cases. This may be due to the limited number of countries with gender policy statements in the field of anesthesia and unclear country-specific legal dispositions for workplace GBM offenders [15].

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1 The aspects of the work environment that are associated with perceptions of workplace GBM among
2 anesthesiologists in Europe and the differences among European countries are currently not clear.
3 The aim of this study is to address this knowledge gap and explore the variables associated with
4 workplace GBM among anesthesiologists in Europe and the specific countries that are more at risk
5 of being subjected to these forms of work-related environmental stress. We expect this ranking to
6 provide a basis for comparing different European countries and, more importantly, serve as a
7 benchmarking tool for monitoring progress over time. In this study, the term "gender" refers to an
8 individual's gender identity, which is distinct from the sex assigned at birth. Gender identity refers to
9 a person's deeply felt sense of gender, regardless of whether it aligns with the sex they were assigned
10 at birth. It encompasses one's internal sense of being male, female, neither, or any other gender
11 identity. It is important to differentiate between gender and sex assigned at birth, as the latter is based
12 on biological attributes such as genitalia, while gender identity is a deeply personal and subjective
13 experience.

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1 **Materials and methods**

2 *Ethics*

3 We conducted a secondary analysis of an existing database that assessed anaesthesiologists' careers,
4 including leadership and research opportunities, clinical work attitudes, and considerations for gender
5 equality. The project underwent a rigorous ethical review process, provided by the Ethics Committee
6 at the University Medical Centre Maribor, Maribor, Slovenia (Chairperson, Associate Professor
7 Milan Reljic, M.D., Ph.D.) and collected under Ref. UKC-MB-KME-75/19 on September 11, 2019.
8 The data were maintained in accordance with the highest ethical standards, including measures to
9 protect the participants' confidentiality and privacy. A separate ethical approval was not required for
10 the publication of the secondary analysis, as the Institutional Review Board review of the initial
11 survey was considered adequate. Moreover, as part of the survey, the respondents explicitly granted
12 permission for an analysis to be published. At the end of the survey, participants were presented with
13 a comprehensive set of questions and informed about the research objectives. They provided informed
14 consent for the use of their responses in the subsequent analyses. As this type of consent ensures that
15 participants have a full understanding of how their data will be used, it is particularly robust and
16 enhances the ethical foundation of our secondary analysis. This study complies with the CROSS
17 EQUATOR reporting guidelines.

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19 *Participants*

20 We conducted an international, Internet-based, cross-sectional survey of anesthesiology physicians.
21 Briefly, we used a 46-item questionnaire to assess anesthesiologists' perceptions of leadership,
22 research opportunities, and clinical work attitudes (Questionnaire – Supplemental Digital Content 1).
23 After a pilot was conducted and validated, the questionnaire was hosted online on SurveyMonkey
24 (SurveyMonkey, San Mateo, CA, USA). It was then distributed through social media using the

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‘snowballing’ sampling technique [16,17]. The survey was available from September 14, 2019 to October 26, 2019, and included 15,714 respondents from 148 countries. The survey completion rate was 80.8% [14]. We aimed to reduce selection bias by collecting at least 10% of the members of the national anesthesiology society for each country or at least five responses per million people [17]. An in-depth description of the survey development and distribution methodology has been published elsewhere [14].

In this secondary analysis, we examined the factors associated with workplace GBM among European anesthesiologists. The survey questionnaire consisted of several items assessing various aspects of gender bias and workplace mistreatment. We focused on the associations and potential predictors of GBM based on the survey responses to question 22: *‘Have you ever been mistreated at your workplace because of your gender?’* (Questionnaire – Supplemental Digital Content 1). Importantly, the questions used as explanatory variables in our regression analyses are independent of the dependent variable (i.e., the presence of GBM). These questions primarily focus on demographic information and perceptions of gender-related disadvantages in leadership and research. As these questions were independent from the outcome variable, we were able to independently analyze their individual contributions to GBM. To ensure the validity of our regression models, we assessed the assumption of independence among the independent variables. This assessment was carried out both before and during the modeling phase. Before initiating regression modeling, we evaluated the potential correlations among the independent variables by computing the correlation matrices and creating scatterplots to visualize any relationships or associations among the independent variables. This pre-modeling assessment allowed us to identify any significant correlations that could affect the independence assumption. Throughout the modeling process, we employed variance inflation factor (VIF) analyses as an additional measure to quantify the degree of multicollinearity among the independent variables. High VIF values indicate problematic levels of multicollinearity that can affect

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the independence assumption of the regression models. We closely monitored the VIF values to ensure that our models met the independence criterion. Regardless, this assumption of independence would not have affected the validity of the regression analyses. We also recognize that additional factors or interactions not captured by these questions may also contribute to GBM, and further research should explore these factors in more detail.

We selected all respondents from European countries, as defined by the European Society of Anesthesiology and Intensive Care and the World Health Organization [18]. Demographic characteristics were assessed, including self-reported gender (woman, man, non-binary), age, and level of training.

Statistical analysis

A descriptive statistical analysis was conducted to determine the characteristics of the respondents. Proportions are reported for categorical variables. Parametric data are reported as the mean (SD) and were analyzed using the Student's t-test. Associations between GBM and the remaining variables were analyzed using univariate and multivariate logistic regression, with the goal of identifying independent predictors. Model fit was examined using the Cox & Snell R Square and Nagelkerke R Square of the variance in checklist completion. Statistical significance was set at $P < 0.05$. Receiver operating characteristic (ROC) curves of the multivariate observations were plotted to assess the predictive performance of the logistic regression model. All the statistical analyses were performed using SPSS version 27 (IBM Corp., Armonk, NY, USA).

Generalized linear mixed models (GLMMs) were then developed to quantify the impact of GBM in each European country. We used GLMMs because they estimate fixed and random effects and are useful when the dependent variable is binary, ordinal, count, or quantitative but not normally distributed [19]. We developed several models using the fixed variables that were statistically

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significant in the prior logistic regression. Among all possible models, we chose the one with the lowest Akaike information criterion (AIC) because this would represent a better model fit. The AIC is an estimator of the prediction error and thereby the relative quality of a statistical model for a given dataset and is used to determine how well a dataset fits the data from which it was generated [20]. We assumed a binomial distribution for the GLMM estimation as this was the most appropriate for modeling the variability in our data, considering the nature of our response variable and the design of the study. We used the logit link function in the GLMM as the response variable was categorical.

Among the models with lower AICs, we chose the one with the fewest variables. The fixed-effect factor covariates in our chosen model were gender, ratio of women to men in the workplace, gender of the department head, and perception of gender as a disadvantage for leadership. The random variable was the country of practice. Fixed-effect factor covariates were estimated using an extended likelihood or first-order Laplace approximation of marginal probability [21]. This approach is suitable for non-Gaussian response distributions, and effectively handles random effects, ensuring accurate parameter estimations and precise GBM score predictions for European countries.

Using the "1 variable per 10 events" criterion, we excluded countries with fewer than 50 total responses. A total of 26 countries were thus included in the GLMM analyses. A random intercept for each country accounted for the intra-country correlations. The statistical significance of the analysis point covariate was tested using the drop in the deviation compared with the null model. The GBM value was analyzed in a manner consistent with its bounded range, acknowledging that the range of possible values associated with this variable was limited. For zero values, a marginal value of 0.001 was added to comply with the beta distribution range. All the analyses were based on the input dataset. For the GLMM, statistical significance was set at $P < 0.05$. Statistical analyses were performed using R and R Studio (R version 4.2.1., The R Foundation for Statistical Computing, Vienna, Austria). The

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following R packages were used in our analysis: ggplot2 (version 3.3.3) [22], lme4 (version 1.1-27) [23], dplyr (version 1.0.6) [24], caret (version 6.0-88) [25], and foreign (version 0.8-82) [26].

Treatment of missing data and response consistency

Our approach to missing data involved the use of multiple imputation techniques to estimate the missing values. This method involves creating several datasets with imputed values for missing data points. The imputed datasets were generated based on the observed information and relationships within the dataset. We then analyzed these datasets and combined the results to consider the variability introduced by the imputation process. To maintain response consistency and ensure data quality, we implemented data validation checks and quality control procedures throughout survey administration and the data collection process. These measures included data validation checks, peer debriefing, and interim analyses. Automated data validation checks were integrated into the online survey platform to ensure that the respondents provided complete and internally consistent responses. For example, we used logic checks to confirm that responses to certain questions were consistent with previous answers or fell within a valid range. Our research team regularly engaged in peer debriefing sessions to collectively review and discuss the survey responses. This iterative process allowed us to identify and rectify any inconsistencies or discrepancies in the data. Finally, we conducted interim analyses in clusters of 1500 responses for open-ended questions. This approach assessed data saturation and identified common themes and emerging patterns. These interim analyses helped us to refine our understanding of the data and maintain response consistency. We used complete case analysis, commonly referred to as listwise deletion, as our method for handling missing data during data analysis. To implement this approach, we first identified missing data for each variable of interest in our dataset. Cases or observations with any missing values for these variables were systematically excluded from the analysis, resulting in a dataset comprising only complete cases.

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Results

In our analysis, we included responses from 43 European countries (n = 5,795) to investigate the factors associated with GBM in the workplace (Table 1). Univariate and multivariate logistic regression analyses were conducted to understand the impact of various factors on the likelihood of experiencing GBM.

The multivariate logistic regression model included four independent variables: age, gender, perception of gender as a disadvantage for leadership, and perception of gender as a disadvantage for research. We also considered interactions such as the ratio of women to men, number of female anesthesiologists per department, and their respective interactions (Supplementary Digital Content 2). The full model, which contained all these predictors, was statistically significant ($P < 0.001$), demonstrating that it could distinguish between individuals who had and those who had not experienced GBM (for detailed logistic regression results, see Supplementary Digital Content 2). Notably, female gender, younger age, and perceiving gender as a disadvantage for leadership or research were identified as independent predictors of GBM.

We employed GLMMs to further explore variations in GBM across European countries. The GLMMs were constructed using a binomial distribution and logit link function suitable for the binary nature of the response variable (presence or absence of GBM). Our chosen GLMM incorporated four fixed-effect predictor variables: gender, ratio of women to men in the workplace, gender of the department head, and perception of gender as a disadvantage for leadership. The random effect was the country of practice. This analysis allowed us to rank European countries based on GLMMs and generate the 2020 European GBM Rank in Anesthesiology (Fig. 1, Table 2). Fig. 2 shows the observed rates of Workplace GBM across various European countries. These rates visually represent the state of GBM in each country, with lower rates indicating a more favorable workplace environment in terms of mistreatment.

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In addition to our primary results, we conducted model validation analyses to assess the predictive performance and reliability of the GLMMs used to predict the GBM scores for each European country. For detailed results and information on model selection, see the Supplemental Digital Contents (Supplemental Digital Content 3: Table S1; Supplemental Digital Content 4: Table S2). These supplementary analyses ensure transparency and provide a comprehensive explanation of the performance of the statistical model.

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Discussion

To the best of our knowledge, this is the first study to analyze GBM data among anesthesiology workplaces in Europe. The most significant predictors of GBM in the workplace were female gender, younger age, perceiving gender as a disadvantage for leadership, and perceiving gender as a disadvantage for research. The 2020 EGMRA, which ranks European countries based on GBM, shows a different ranking from well-known gender equity indices for European countries [27-29], where central and northern European countries are usually placed in the top positions.

Given that gender equity is fundamental for developing more collaborative environments, increasing teamwork efficacy [30], and improving patient outcomes [31-34], effective monitoring of gender equity in the field of anesthesiology is essential. We compared the countries' overall performance in achieving gender equity in anesthesia using a single measure that combines multiple indicators and dimensions into a single standardized value. The GBM score generated from this study may offer insights into overall gender inequality and inequity in the field of anesthesiology at the national level. It can function as a crucial benchmark for gender equity and could be used to chart the evolution of gender equity over time.

The fact that our predictors for GBM were female gender and younger age was not surprising. Female residents are at risk of several forms of GBM [3,7,35] and are more likely than male residents to report experiences of gender-based discrimination and harassment [4,14,36]. Our GBM ranking shows that mistreatment in anesthesiology does not follow general patterns of gender equity, as seen in the Gender Equality Index [27] or the Global Gender Gap Index [37]. These indices consistently show better performance for Scandinavian countries compared to other European countries, and Mediterranean countries frequently perform below the European average. Thus, applying these general indices to the medical workforce may be inappropriate. These indices primarily measure human development while accounting for gender inequity [29] rather than directly addressing

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specific factors and considerations pertinent to GBM in the context of the workforce in the medical sector.

Additionally, the degree to which women in anesthesiology face inequity today may differ among countries without necessarily implying a cultural or geographical relationship. However, our ranking trend loosely resembles Eurofound's index of adverse social behaviors for healthcare workers, where Central, Western European, and Scandinavian countries show the highest percentages of workers reporting violence or harassment in the workplace. Eurofound, short for the European Foundation for the Improvement of Living and Working Conditions, is an EU agency that primarily aims to provide research and information on social and work-related issues to support policy development in Europe. In contrast, a smaller proportion of workers reported GBM in half of the Eastern and Southern European countries [36].

In our analysis, Italy was found to have the lowest gender mistreatment among the countries studied. While pinpointing the precise reasons for this distinction requires careful examination, several pertinent factors may have contributed to Italy's relatively lower index value. First, Italy's legislative framework and policies regarding GBM and workplace harassment within the medical sector, including anesthesiology, may be more robust and diligently enforced than those in other countries [38]. Robust legal safeguards and effective reporting mechanisms can reduce the incidence of gender mistreatment. Cultural and societal norms also play pivotal roles in shaping workplace dynamics. Italy may have made significant advancements in promoting gender equality and cultivating respectful environments within anesthesiology [39,40]. Furthermore, Italy's leadership within anesthesiology societies, such as the Società Italiana di Anaesthesia Analgesia Rianimazione e Terapia Intensiva (SIAARTI), may have significantly influenced the lower gender mistreatment index among anesthesiologists. The presence of women in influential roles, including as board chairs, can also foster an inclusive and respectful workplace culture [38]. Therefore, effective reporting

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mechanisms require further consideration. Italy may have established accessible and efficient systems for reporting gender mistreatment incidents within the field of anesthesiology, which can encourage victims to come forward.

Nevertheless, even within specific medical specialties such as anesthesiology, international comparisons of gender mistreatment indices can be complex because of variations in reporting practices and data collection methods. Italy's lower index may reflect recent improvements in addressing gender mistreatment within anesthesiology, while other countries may still be implementing comprehensive measures, like, for example, the implementation of clear policies, training programs, reporting mechanisms, diversity initiatives, leadership commitment, and research to tackle gender-based mistreatment and discrimination. Although our analysis suggests that Italy exhibits a lower gender mistreatment index within the specialized context of anesthesiology, further in-depth research into the interplay of these factors and a meticulous examination of workplace practices, policies, and cultural attitudes specific to anesthesiology are needed to gain a more nuanced understanding of this phenomenon.

Some evidence suggests that having more women in leadership roles may be associated with less GBM in the workplace, including sexual harassment and discrimination [41-44]. However, this correlation does not necessarily imply causation. Other factors, such as organizational culture and policies, may also play a role in reducing GBM in the workplace.

Overall, many factors contribute to higher levels of gender harassment among healthcare workers in some European countries. These factors include the absence of legal protections, workplace culture and policies, education and training, and societal norms and values [36]. It is difficult to directly compare the GBM of anesthesiologists in Greece, our worst-ranked country, and other European countries, as GBM is influenced by many factors. However, anesthesiologists in Greece may encounter higher GBM levels partly due to the severe economic crisis that occurred the decade before

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1 data collection, leading to cuts in healthcare spending and hospital understaffing [45]. The Greek
2 healthcare system has been underfunded for many years, leading to a shortage of resources, such as
3 medical supplies, equipment, and hospital beds [46]. Despite recent legislation by the Greek
4 government [47] creating policies against violence and harassment in the workplace, enforcement
5 mechanisms may still be lacking, making it easier for GBM to occur.

6 *Limitations*

7 Although our secondary analysis provided valuable insights into the rankings of GBM among
8 European countries based on the collected data, the study had some limitations. This study represents
9 a secondary analysis of a pre-existing dataset. Although the primary survey was global in scale,
10 exploring the European subset provides a valuable opportunity to gain region-specific insights. Our
11 logistic regression analysis identified factors linked to GBM within the European context. It is
12 important to note that this focus on Europe entailed a reduction in sample size, which is acknowledged
13 as a tradeoff. We also acknowledge that gender inequity is multifaceted and thus is often measured
14 using multiple indicators. While gender equity in anesthesia must be effectively monitored, specific
15 dimensions of GBM may also require qualitative assessments. This recognition acknowledges the
16 multifaceted nature of gender equity and the need for subjective experiences and qualitative aspects
17 to be captured that cannot be easily measured numerically. Therefore, combining quantitative and
18 qualitative assessments would provide a more holistic understanding of gender equity in anesthesia
19 and help in addressing the diverse factors that contribute to gender disparities. Additionally, we only
20 examined gender, thus other protected characteristics (e.g., ethnicity, sexual orientation, disability)
21 that should be considered for a more comprehensive understanding of GBM were not assessed. For
22 instance, the observation that women from Low- and Middle-Income Countries (LMICs) appear more
23 'content' than those from Upper Income Countries (UICs), as mentioned in our recent paper [14],
24 warrants further investigation to identify the specific factors that contribute to these sentiments.

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Efforts to reduce GBM within healthcare, particularly in fields such as anesthesiology, can benefit significantly from data-supported actions. These actions involve harnessing data to inform and implement strategies. Robust data collection and analyses help clarify the prevalence and patterns of GBM and identify areas that require attention [14]. Grounded in data-guided insights, educational programs and awareness campaigns can promote respectful behavior among healthcare professionals and raise awareness about GBM. Data-guided policymaking ensures the development and enforcement of effective anti-GBM measures. In addition, training programs, diverse leadership initiatives, and support for victims can be tailored to data-derived needs [12]. Conducting observations, evaluations, and ongoing research has further enhanced these efforts. International collaboration in sharing data and best practices widens the impact and creates safer and more equitable healthcare environments [48].

Although our study provides valuable insights into the prevalence of GBM among anesthesiologists across Europe, certain limitations must be acknowledged. We recognize that the number of respondents varied according to country, which could have introduced bias into our findings. However, we took steps to address this issue. First, we restricted our analysis to countries meeting specific criteria, including a minimum number of responses (either five per million population or 10% of the members of the national anesthesiologists' associations). Second, for robust statistical analysis, we required a minimum of 50 respondents per country. Another limitation was the lack of essential demographic and sociodemographic factors in our study such as race, sexual orientation, and disability, all of which could influence how individuals perceive and experience GBM. However, collecting more detailed demographic information may have raised ethical concerns and affected respondents' willingness to participate. Furthermore, the GBM scores obtained in this study represent only a snapshot assessment of the second half of 2019. Nevertheless, the key aspects of the GBM explored in our analysis can serve as a foundation for future research to track trends in this area over

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time. In addition, the survey responses could have been affected by subjective judgments. The limitations of our previous study [14] regarding the potential for bias and subjectivity in respondents' answers also apply to this dataset. We also recognize that the reported rates of GBM may not accurately reflect the true prevalence in each country. Some healthcare workers may choose not to report GBM because of fear of retaliation or job loss. Additionally, some hospitals or healthcare settings may have a culture of tolerance towards GBM or the expectation that healthcare workers should endure mistreatment as part of their job. Such analyses usually benefit from external validation, which was not possible in this study; the data are only from Europe and may not be generalizable to other parts of the world. It is also important to clarify that our intention was not to make broad generalizations based on a single example. Although collecting additional direct information or conducting further surveys involving Italian respondents could have resulted in a more comprehensive understanding, such extensive investigations were beyond the scope of this study. Moreover, providing explanations of our findings may be challenging because data on GBM in anesthesia and other fields are limited in most European countries. Finally, although the original survey included a non-binary gender option, only a small proportion of participants identified as non-binary; therefore, further statistical analyses were precluded. These limitations underscore the need for ongoing research efforts to offer a more holistic understanding of GBM in the context of anesthesiology across Europe. Incorporating nuanced analyses that consider contextual factors, such as national policies, institutional dynamics, and healthcare system structures, is essential for understanding the complexities of GBM across different countries. Further examinations of cases in Italy, where potential preferential treatment policies exist, could provide valuable insights into how these factors intersect with the anesthesiologists' experiences of GBM.

Scientific and institutional interest in workplace inequity is rapidly increasing. Therefore, our methodologically-validated ranking could be used as a monitoring tool. However, specific

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1 intrapersonal, interpersonal, or socio-environmental factors are often used as an inaccurate

2 explanation for the cause of GBM. Our ranking aims not only to provide initial insight into GBM

3 among anesthesiologists in Europe, but also to function as a key benchmark for gender equity and

4 to chart the evolution of disparities over time.

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Table 1. European countries included in the analysis (ordered alphabetically), n = 5795

Country	Respondents (n)	Women respondents n (%)	Women : men departmental ratio (mean [SD])	Age (years; mean [SD])	Gender as disadvantage for research (n [%] of agree/unsure)	Gender as disadvantage for leadership (n [%] of agree/unsure)	Woman as current HOD n (%)	Woman as past HOD n (%)	Ever been mistreated at workplace n (%)	Reported the incident n (%)
Albania	7	3 (43)	0.34 (0.19)	45 (7)	1 (25)	2 (33)	2 (29)	2 (29)	3 (43)	1 (33)
Armenia	16	8 (50)	0.35 (0.22)	42 (13)	3 (30)	3 (30)	2 (13)	5 (31)	1 (6)	0 (0)
Austria	287	151 (53)	0.49 (0.16)	44 (11)	33 (22)	122 (48)	25 (9)	45 (16)	68 (24)	11 (16)
Belgium	133	62 (47)	0.44 (0.14)	41 (12)	12 (19)	31 (30)	54 (41)	15 (12)	18 (14)	3 (17)
Bosnia & Herzegovina	55	33 (60)	0.56 (0.23)	40 (8)	13 (43)	28 (64)	19 (35)	15 (29)	20 (36)	3 (15)

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Bulgaria	42	21 (50)			8 (44)	13 (41)	11 (26)	16 (38)	16 (38)	2 (13)
Croatia	115	81 (70)	0.68 (0.14)	42 (9)	17 (35)	49 (47)	54 (47)	38 (33)	52 (45)	5 (10)
Cyprus	13	10 (77)	0.71 (0.23)	43 (10)	0 (0)	0 (0)	9 (69)	5 (56)	4 (31)	3 (75)
Czech Republic	59	33 (56)	0.56 (0.12)	37 (9)	8 (25)	25 (46)	4 (7)	3 (5)	14 (24)	3 (21)
Denmark	91	44 (48)	0.45 (0.14)	44 (9)	6 (43)	27 (33)	13 (14)	18 (21)	21 (23)	4 (18)
Estonia	49	29 (59)	0.58 (0.14)	42 (11)	2 (10)	16 (35)	7 (14)	10 (21)	9 (18)	1 (11)
Finland	101	53 (53)	0.54 (0.15)	47 (11)	22 (51)	19 (23)	46 (46)	30 (31)	22 (22)	3 (14)
France	301	123 (41)	0.45 (0.17)	42 (12)	42 (38)	78 (31)	70 (25)	64 (23)	51 (17)	13 (26)
Georgia	7	3 (43)	0.61 (0.09)	40 (8)	0 (0)	0 (0)	3 (43)	2 (29)	0 (0)	NA
Germany	420	177 (42)	0.47 (0.15)	41 (10)	60 (36)	149 (41)	18 (4)	24 (6)	96 (23)	24 (25)
Greece	105	68 (65)	0.65 (0.17)	43 (9)	13 (39)	29 (31)	77 (74)	55 (53)	46 (44)	14 (30)
Hungary	63	38 (60)	0.58 (0.13)	43 (12)	9 (31)	27 (52)	12 (19)	19 (30)	26 (41)	5 (19)
Iceland	15	7 (47)	0.43 (0.09)	50 (10)	0 (0)	1 (8)	5 (33)	1 (7)	3 (20)	0 (0)
Ireland	60	29 (48)	0.34 (0.11)	41 (9)	10 (53)	18 (35)	36 (60)	3 (5)	16 (27)	3 (19)

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Israel	47	14 (30)	0.30 (0.10)	47 (13)	5 (36)	8 (23)	3 (6)	0 (0)	8 (17)	1 (13)
Italy	869	545 (63)	0.57 (0.15)	42 (11)	120 (47)	451 (58)	203 (24)	108 (13)	203 (23)	98 (49)
Kosovo	6	3 (50)	0.49 (0.07)	49 (13)	0 (0)	3 (75)	0 (0)	1 (17)	3 (50)	1 (33)
Latvia	36	25 (69)	0.60 (0.15)	35 (10)	4 (33)	12 (40)	26 (74)	10 (29)	5 (14)	0 (0)
Lithuania	27	19 (70)	0.65 (0.13)	33 (9)	3 (27)	7 (33)	14 (52)	13 (48)	13 (48)	1 (8)
Malta	27	13 (48)	0.46 (0.04)	38 (10)	4 (29)	11 (41)	0 (0)	0 (0)	5 (19)	2 (40)
Montenegro	4	2 (50)	0.45 (0.37)	41 (3)	0 (0)	2 (67)	2 (50)	3 (75)	2 (50)	1 (50)
Netherlands	124	60 (48)	0.46 (0.14)	43 (10)	9 (24)	31 (28)	14 (12)	8 (7)	24 (19)	5 (21)
Norway	37	17 (46)			3 (19)	8 (29)	13 (35)	9 (26)	10 (27)	1 (10)
Poland	170	101 (59)	0.57 (0.16)	41 (10)	18 (21)	55 (39)	30 (18)	43 (26)	41 (24)	4 (10)
Portugal	192	126 (66)	0.67 (0.17)	40 (10)	15 (18)	50 (29)	87 (46)	111 (59)	28 (15)	6 (21)

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Republic of Moldova	31	18 (58)	0.52 (0.18)	34 (7)	2 (18)	10 (44)	4 (13)	6 (20)	11 (36)	2 (18)
Republic of North Macedonia	31	27 (87)	0.68 (0.15)	35 (7)	11 (52)	8 (29)	21 (68)	21 (68)	12 (39)	2 (17)
Romania	216	145 (67)	0.70 (0.20)	40 (10)	31 (28)	51 (31)	144 (67)	96 (46)	57 (26)	15 (26)
Russia	130	51 (39)	0.39 (0.20)	41 (10)	13 (25)	28 (33)	28 (22)	24 (19)	16 (13)	5 (31)
Serbia	89	68 (76)	0.70 (0.23)	43 (9)	14 (39)	23 (35)	59 (66)	53 (60)	26 (29)	11 (42)
Slovakia	42	20 (48)	0.60 (0.17)	39 (11)	4 (18)	15 (42)	7 (17)	17 (41)	7 (17)	1 (14)
Slovenia	80	55 (69)	0.60 (0.12)	38 (10)	15 (31)	24 (32)	64 (80)	31 (39)	28 (35)	4 (14)
Spain	631	399 (63)	0.59 (0.14)	44 (10)	75 (36)	226 (43)	189 (30)	155 (25)	195 (31)	20 (10)
Sweden	110	41 (37)	0.41 (0.11)	44 (10)	16 (33)	28 (29)	49 (45)	33 (31)	23 (21)	2 (9)

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Switzerland	112	57 (51)	0.53 (0.14)	40 (9)	19 (46)	57 (56)	3 (3)	11 (10)	31 (28)	5 (16)
Turkey	256	173 (68)	0.59 (0.23)	41 (9)	20 (32)	63 (32)	166 (65)	158 (64)	71 (28)	16 (23)
Ukraine	247	103 (42)	0.41 (0.20)	38 (11)	33 (27)	49 (29)	55 (22)	45 (19)	46 (19)	11 (24)
United Kingdom	342	159 (47)	0.41 (0.13)	44 (9)	40 (27)	85 (28)	114 (34)	97 (29)	75 (22)	12 (16)

HOD: head of department, n: number, NA: not applicable, SD: standard deviation.

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Table 2. Workplace gender-based mistreatment ranking - the 2020 European gender-based Mistreatment Rank in Anaesthesiology: results for the generalized linear mixed model with a binary dependent variable.

Country	n = 5,358	betas
Italy	869	1.537
Portugal	192	1.611
Russia	130	1.623
Belgium	133	1.721
Serbia	89	1.799
Austria	287	1.825
Poland	170	1.910
France	301	1.923
Czech Republic	59	1.938
Sweden	110	1.945
Denmark	91	1.953
Switzerland	112	1.956
Finland	101	1.960
The Netherlands	124	2.001
Turkey	256	2.008
Romania	216	2.011
Ukraine	247	2.056
Ireland	60	2.060
Germany	420	2.095

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Bosnia and Herzegovina	55	2.199
Slovenia	80	2.216
UK	342	2.232
Spain	631	2.326
Hungary	63	2.434
Croatia	115	2.521
Greece	105	2.916

The fixed effects in the model with their regression coefficients are as follows: intercept (−3.124), female gender (2.078), ratio of women to men in the department (−0.108), gender of the department head (woman) (0.119), gender as a disadvantage for leadership (1.305), and AIC (3,614). Lower regression coefficients indicate better performance.

AIC: Akaike information criterion, n: number of respondents.

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Figure Legends

Fig. 1. Workplace gender-based mistreatment ranking for anesthesiology in European countries: the 2020 European Gender-Based Mistreatment Rank in Anesthesiology. Lower regression coefficients (green) indicate better performance.

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Fig. 2. Observed rates of workplace-GBM. This figure illustrates the observed rates of workplace gender-based mistreatment among various European countries. The rates visually represent the state of mistreatment in each country. Lower rates indicate better performance (lower rates of gender-based mistreatment in the workplace). The figure is meant as a complementary visual representation of the mistreatment data to be used alongside our modeling results.

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Supplemental Digital Files

Supplemental Digital Content 1: Questionnaire

Supplemental Digital Content 2: Detailed statistical results of the logistic regression

Supplemental Digital Content 3: Table S1: Workplace gender-based mistreatment ranking - the 2020 European Gender-Based Mistreatment Rank in Anesthesiology: results for the generalized linear mixed model with a binary dependent variable and five independent variables.

Supplemental Digital Content 4: Table S2: Workplace Gender-based mistreatment ranking - the 2020 European Gender-Based Mistreatment Rank in Anesthesiology: results for the generalized linear mixed model with a binary dependent variable and nine independent variables.

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Gender distribution among anaesthesiologists

Dear colleagues!

With this anonymous survey we aim to explore gender distribution among anaesthesiologists (doctors, holding a medical degree) globally. We focus on opportunities in departmental leadership, clinical work, and research.

Ethical committee has reviewed and approved this project.
The survey takes 5 to 10 minutes to complete. There are some questions marked with asterisk (*) which are required to be answered in order to proceed to the next section.

The survey is available in English, French, German, Italian, Portuguese, Russian and Spanish (please choose your language in the top right corner of the screen).

We thank you very much for your contribution,

Denisa Osinova, Joana Berger-Estilita, Sonia Vaida, Richard Prielipp, Sorin J Brull, Marko Zdravkovic

1. I work as an anaesthesiologist in the operating theatre (as trainee, resident, specialist, consultant or attending) *

- Yes
- No

Work related data and demographics

2. What is your current level of clinical training?

- Trainee/resident in the FIRST half of training
- Trainee/resident in the SECOND half of training
- Specialist for LESS than 10 years
- Specialist for MORE than 10 years

3. What is your age?

4. Do you have a child/children to take care of at home?

- Yes
- No

5. On average, how many hours per week do you spend working on your career (including clinical work, research/academic work, and any leadership positions)?

- less than 20 hours
- 20 to 40 hours
- 41 to 60 hours
- 61 to 80 hours
- more than 80 hours

6. Concerning your career plans, rate the importance of each of the following aspects from 1 (not important) to 5 (very important)

	1	2	3	4	5
Taking a leadership position in my department					
Doing clinical work					
Doing research					

Departmental leadership

7. What is the TOTAL number of anaesthesiologists in your department (including trainees/residents)?

8. What is the number of FEMALE anaesthesiologists in your department (including trainees/residents)?

9. What is the gender of your current head of department?

- Female
- Male
- Non-binary

10. What was the gender of the immediate past head of your department (i.e. the one immediately before current head of department)?

- Female
- Male
- Non-binary

11. Are you a current or past head of your department? *

- Yes (proceed to Q17)
- No (proceed to Q12)

Departmental leadership - continued

Please rate your agreement with the following statements:

12. "I would like to become the head of my department in the future"

- Strongly agree
- Agree
- Unsure
- Disagree
- Strongly disagree

13. "I would like to take some other leadership role in my department in the future"

- Strongly agree
- Agree
- Unsure
- Disagree
- Strongly disagree

14. If you agree or strongly agree with the statement above, please describe the leadership role that you would like to take (e.g., in simulation, quality improvement, specialised clinical service etc.):

15. “My gender is a DISADVANTAGE when competing for a leadership position in my department”

- Strongly agree
- Agree
- Unsure
- Disagree
- Strongly disagree

16. Please describe any barriers for you to take a leadership position in your department:

17. What is your gender? *

- Female (proceed to Q18)
- Male (proceed to Q18)
- Non-binary (proceed to Q26)

Clinical work experience

Please rate your agreement with the following statements:

18. “Doctors in my department have better attitude towards female anaesthesiologists than male anaesthesiologists”

- Agree
- Treated equally
- Disagree (i.e. female anaesthesiologists are treated worse)

19. “Nurses in my department have better attitude towards female anaesthesiologists than male anaesthesiologists”

- Agree
- Treated equally
- Disagree (i.e. female anaesthesiologists are treated worse)

20. “Our patients have better attitude towards female anaesthesiologists than male anaesthesiologists”

- Agree
- Treated equally
- Disagree (i.e. female anaesthesiologists are treated worse)

21. “Our surgeons have better attitude towards female anaesthesiologists than male anaesthesiologists”

- Agree
- Treated equally
- Disagree (i.e. female anaesthesiologists are treated worse)

22. Have you ever been mistreated at your workplace because of your gender?

- Yes (proceed to Q23)
- No (proceed to Q34)

Clinical work experience - continued

23. By whom have you been mistreated? (check all that apply):

- Colleague anaesthesiologist
- Nurse
- Patient
- Surgeon
- Other:

24. Have you reported the incident?

- Yes
- No

25. Has anyone supported you?

- Yes
- No

(proceed to Q34)

Clinical work experience - non-binary genders

Please rate your agreement with the following statements:

26. "Doctors in my department have better attitude towards (your gender) anaesthesiologists than male or female anaesthesiologists"

- Agree
- Treated equally
- Disagree (i.e. my gender anaesthesiologists are treated worse)

27. "Nurses in my department have better attitude towards (your gender) anaesthesiologists than male or female anaesthesiologists"

- Agree
- Treated equally
- Disagree (i.e. my gender anaesthesiologists are treated worse)

28. "Our patients have better attitude towards (your gender) anaesthesiologists than male or female anaesthesiologists"

- Agree
- Treated equally
- Disagree (i.e. my gender anaesthesiologists are treated worse)

29. "Our surgeons have better attitude towards (your gender) anaesthesiologists than male or female anaesthesiologists"

- Agree
- Treated equally
- Disagree (i.e. my gender anaesthesiologists are treated worse)

30. Have you ever been mistreated at your workplace because of your gender?

- Yes (proceed to Q31)
- No (proceed to Q34)

Clinical work experience - non-binary genders - continued

31. By whom have you been mistreated? (check all that apply):

- Colleague anaesthesiologist
- Nurse
- Patient
- Surgeon
- Other:

32. Have you reported the incident?

- Yes
- No

33. Has anyone supported you?

- Yes
- No

Research experience

34. Have you done any research study? *

- Yes (proceed to Q35)
- No (proceed to Q39)
- Other (e.g. case reports, audits, evaluations, letter-to-editors etc) (proceed to Q39)

Research opportunities

35. How many peer reviewed articles in indexed journals have you co-authored over the last two years?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- More than 6

36. How many presentations have you personally presented at the national/international meetings over the last two years?

- 0
- 1
- 2
- 3
- 4
- 5
- 6

- More than 6

37. Please rate your agreement with the statement: "My gender is a DISADVANTAGE when doing research at my department"

- Strongly agree
- Agree
- Unsure
- Disagree
- Strongly disagree

38. Please describe any barriers for you to do research at your department:

(proceed to Q42)

Research opportunities

39. Please rate your agreement with the statement: "I would like to do research in the future"

- Strongly agree
- Agree
- Unsure
- Disagree
- Strongly disagree

40. Please rate your agreement with the statement: "My gender is a DISADVANTAGE when doing research at my department"

- Strongly agree
- Agree
- Unsure
- Disagree
- Strongly disagree

41. Please describe any barriers for you to do research at your department:

Conclusion - please press "DONE" button below

42. Please suggest what could be done to improve gender equality in leadership, research and/or clinical work at your department? Please explain

43. Any other comments / suggestions?

44. Would you please share your current COUNTRY of anaesthesia practice:

45. Would you please share the name of the CITY where you currently practice anaesthesia (we need this information for assessing the spread/reach of the survey; this will only be reported in aggregate as, for example, “10 cities from Switzerland”):

46. Would you be so kind to give permission to include your anonymous responses in the analysis and publication? *

- Yes
- No

Don't forget to click on “DONE” button below and please spread the word

We would much appreciate if you could copy and send this message to your colleagues: Dear colleagues, I do hope you are doing well. By following the link below, you will access an anonymous survey about gender distribution in anaesthesia. The results would shed light on gender inequalities and potentially help us suggest measures to improve parity in opportunities for leadership, clinical work, and research. The survey is being led by an international group of anaesthesiologists from Slovak Republic, Slovenia, Switzerland and USA. Here is the link (survey takes only 5 - 10 min to complete): https://www.surveymonkey.com/r/DWSTVGD

If you could share the link within your department/country (or wider) would be great. Many thanks for your support, sincerely, Marko Zdravkovic Contact details: markozdravkovic@gmail.com http://linkedin.com/in/marko-zdravković-9b17726a @MZanaesthetist

Supplemental Material File 3: Results of the Logistic Regression

Direct logistic regression was performed to assess the impact of various factors on the likelihood of suffering GBM, as perceived by the responders. The model contained four independent variables (age, gender, perception of gender as a disadvantage for leadership, and perception of gender as a disadvantage for research) and a set of interactions (men to women ratio, number of women anesthesiologists per department and respective interaction) (Table 2, below). The full model containing all predictors was statistically significant (χ^2 (7, N=2514), F = 623.44, p<0.001), indicating that the model could distinguish between those who suffered GBM and those who did not (AUC 0.803 [95%CI 0.783 to 0.822], p<0.001, Figure 1, below). The model explained between 22.0% (Cox & Snell R Square) and 32.4% (Nagelkerke R squared) of the variance in suffering GBM. Independent predictors for suffering GBM were being a woman, having a younger age, considering that gender is a disadvantage for leadership and considering that gender is a disadvantage for research. Table 2 below shows the univariate and multivariate logistic regression analyses of all variables tested for association with GBM at the workplace.

Table 2: Univariate and multivariate multiple logistic regression analysis of the factors associated with mistreatment at the workplace.

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	Univariate			**Multivariate**		
	Crude OR	95%CI	p	Adjusted OR	95%CI	p
Gender						
Women	11.6	(9.71 to 13.9)	**<0.001**	12.0	(5.03 to 29.4)	**<0.001**
*Men**	--	--	--	--	--	--

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Age (years)	0.983	(0.977 to 0.988)	**<0.001**	0.962	(0.929 to 0.995)	**0.026**
Level of training						
*Trainee in the 1st half of training**	--	--	--	--	--	
Trainee in the 2nd half of training	1.143	(0.888 to 1.472)	0.298			
Specialist < 10 years	2.941	(0.973 to 1.515)	0.086			
Specialist≥ 10 years	0.834	(0.671 to 1.037)	0.103			
Carer of children (yes)	0.931	(0.826 to 1.050)	0.245			
Working on career (in hours)§						
*<20 hours**	--	--	--			
20-40 hours	1.112	(0.807 to 1.533)	0.517			
40-60 hours	1.013	(0.765 to 1.342)	0.928			
60-80 hours	1.205	(0.896 to 1.621)	0.218			
>80 hours	1.244	(0.856 to 1.807)	0.253			

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Importance of having a leadership role	0.926	(0.817 to 1.049)	0.228			
Importance of doing clinical work	0.906	(0.761 to 1.078)	0.226			
Importance of doing research	1.115	(1.017 to 1.313)	**0.027**			#
Number of anaesthestists in department	1.000	(1.000 to 1.000)	0.632			
Number of women anaesthestists in department (1)	1.004	(1.001 to 1.006)	**0.002**	1.043	(0.998 to 1.090)	0.064[&]
Men:Women ratio (2)	3.208	(2.264 to 4.545)	**<0.001**			#
Interaction (1)x(2)	1.006	(1.003 to 1.010)	**<0.001**	0.951	(0.983 to 1.013)	0.118[&]
Woman as HOD	0.797	(0.702 to 0.906)	**<0.001**			#
Woman as past HOD	0.970	(0.844 to 1.116)	0.674			
Willingness to be HOD	1.128	(0.967 to 1.318)	0.126			
Willingness to take a leadership role	1.207	(1.062 to 1.372)	**0.004**			#

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Gender as disadvantage for leadership	6.175	(5.322 to 7.165)	**<0.001**	2.144	(1.118 to 3.998)	**0.021**
Gender as disadvantage for research	6.014	(4.658 to 7.765)	**<0.001**	6.369	(2.592 to 15.646)	**<0.001**
Considering that doctors have better attitudes towards women doctors	0.350	(0.266 to 0.462)	**<0.001**	0.443	(0.185 to 1.060)	0.067[&]
Considering that nurses have better attitudes towards women doctors	0.534	(0.413 to 0.691)	**<0.001**			#
Considering that patients have better attitudes towards women doctors	0.524	(0.398 to 0.690)	**<0.001**			#
Considering that surgeons have better attitudes towards women doctors	0.402	(0.311 to 0.520)	**<0.001**			#
Doing research studies	1.003	(0.908 to 1.117)	0.956			
Number of articles published	1.009	(0.954 to 1.068)	0.744			
Number of presentations	0.996	(0.947 to 1.048)	0.888			

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Income category			
*High**	--	--	--
upper-middle	1.031	(0.723 to 1.470)	0.866
low&lower-middle	1.202	(0.682 to 2.118)	0.524

*used as the reference category for the calculation of the OR.

excluded due to statistically nonsignificant relationship with mistreatment at the workplace, for a significance level of p=0.25.

& nonsignificant in the logistic multilinear model.

HOD, head of department;

Results are presented in the form of Odds Ratios (OR), corresponding 95% confidence intervals (95%CI) and p-values (Wald).

§ *"Working on career" refers to the holistic and ongoing efforts individuals make to advance their professional growth and development beyond their routine job responsibilities. It encompasses activities such as continuous learning, skill enhancement, networking, goal setting, research, leadership development, and achieving a work-life balance, all aimed at achieving long-term career objectives and success.*

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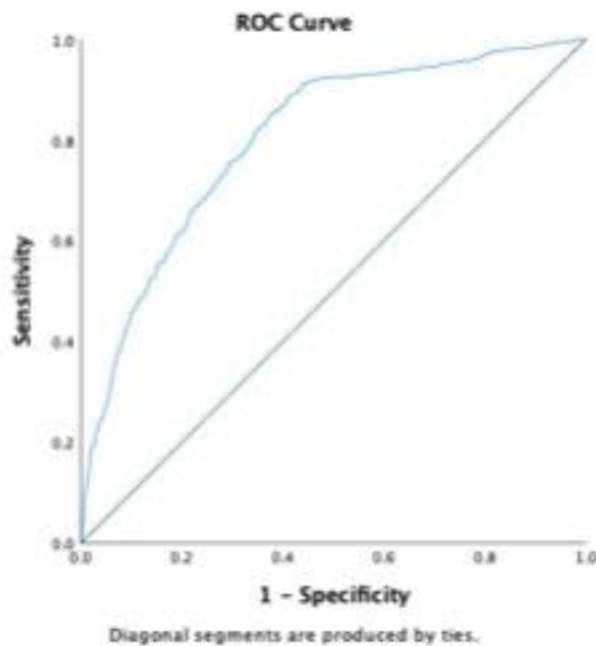

Figure S1: Receiver operator characteristic (ROC) curve for the logistic regression model for gender-based mistreatment (GBM) in anaesthesiology in European countries. The AUROC of 0.803 [95%CI 0.783-0.822] showed a very good discrimination ability to distinguish between those anesthesiologists who suffered GBM and those who did not. There is no evidence of poor model calibration (Hosmer-Lemeshow test p<0.001)

To gain further insights and understand the variations in GBM across European countries, we then employed GLMMs. The GLMMs were built with a binomial distribution, and the logit link function was chosen, considering the categorical nature of the response variable (presence or absence of GBM). Our chosen GLMM included four fixed-effect predictor variables: gender, ratio of women to men in the workplace, gender of the head of department, and perception of gender as a disadvantage for leadership. The random effect was the country of practice. This allowed us to rank European countries based on the GLMMs to produce the 2020 European Gender-Based Mistreatment Rank in Anesthesiology (2020 EGMRA, Figure 1, main document). A total of 26 European countries met the

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required statistical criteria for the secondary analysis, accounting for 5358 respondents. This allowed us to rank European countries based on the GLMMs to produce the 2020 European Gender-Based Mistreatment Rank in Anesthesiology (2020 EGMRA). In Figure 2 (main document), we also present the observed rates of workplace-based mistreatment among various European countries. These rates offer a visual representation of the mistreatment situation in each country, with lower rates indicating a more favourable workplace environment regarding mistreatment.

Besides presenting our primary results, we have conducted model validation analyses to assess the predictive performance and reliability of the GLMM used for predicting GBM scores for each European country. Detailed results of these validation analyses and additional insights into model selection are provided in the supplementary material (Supplementary Material 3: Table S1; Supplementary Material 4: Table S2). These supplementary analyses aim to ensure transparency and provide interested readers with a comprehensive understanding of the model's performance.

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Table S1: Workplace-based mistreatment ranking - the 2020 European Mistreatment Rank in Anaesthesiology: results for the generalised linear mixed model with a binary dependent variable and 5 independent variables (see footer). Lower regression coefficients indicate a better situation concerning mistreatment at the workplace .

countries	n=5358	betas
Serbia	89	1,64409685
Austria	287	1,64520407
Romania	216	1,70044952
Turkey	256	1,7594303
Denmark	91	1,76620912
Finland	101	1,80225499
Switzerland	112	1,81415501
Sweden	110	1,84245503
UK	342	1,86732313
Portugal	192	1,87765558
Russia	130	1,8973413
Italy	869	1,91434106
Ireland	60	1,94465811
Poland	170	1,94769137
Czech Republic	59	1,94963289
Germany	420	1,96608835
Belgium	133	1,98817537
Slovenia	80	1,99489775

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Hungary	63	2,02086742
France	301	2,0930684
Ukraine	247	2,09749334
Bosnia and Herzegovina	55	2,14366276
Netherlands	124	2,19139828
Croatia	115	2,20329577
Greece	105	2,33153387
Spain	631	2,370301

Fixed effects in the model with their regression coefficients are: Intercept (-3.645), Women (1.96), Gender of the head of department – women (0.132), Gender disadvantage for leadership (0.787), Leadership role (0,495), disadvantage research (0,787), AIC (3979)

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Table S2: Workplace-based mistreatment ranking - the 2020 European Mistreatment Rank in Anaesthesiology: results for the generalised linear mixed model with a binary dependent variable and 9 independent variables (see footer). Lower regression coefficients indicate a better situation concerning mistreatment at the workplace .

countries	n=5358	betas
Serbia	89	1,58617695
Romania	216	1,67090382
Turkey	256	1,71478524
Austria	287	1,72540644
Italy	869	1,73369308
Portugal	192	1,76786021
Finland	101	1,76942935
Switzerland	112	1,77690769
UK	342	1,78152126
Denmark	91	1,78472887
Sweden	110	1,8278594
Czech Republic	59	1,83761998
Russia	130	1,84952292
Ireland	60	1,85908017
Slovenia	80	1,8816658
Hungary	63	1,88535263
Belgium	133	1,89840306
Poland	170	1,90953971

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Germany	420	1,95440522
Bosnia and Herzegovina	55	1,96912038
Ukraine	247	1,99805126
Croatia	115	2,02831145
France	301	2,06695626
Netherlands	124	2,09314531
Greece	105	2,17966314
Spain	631	2,20542463

Fixed effects in the model with their regression coefficients are: Intercept (-1.892), Women (1.880), Gender of the head of department – women (0.144, Leadership role (0,514), disadvantage research (0,548), disadvantage leardership (0.696), Doctors_better_bin (-0.7269, Nurses better bin (-0.579), patients better bin (-0.281), sugeons better bin (-0.609) AIC (3697)

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