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Review Article

First author gender equality trends in publication of mitochondrial neuro gastrointestinal encephalopathy- MNGIE disease

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ABSTRACT

Mitochondrial neuro gastrointestinal encephalopathy (MNGIE) is a rare autosomal recessive genetic condition caused mainly by thymidine phosphorylates (TP) deficiency and TYMP mutations. Gender equality in scientific publishing is crucial for fostering inclusive practices and promoting diversity in research. This research article conducted a bibliometric analysis using PubMed as the primary data source. The analysis focused on studying the trends and patterns of first author gender equality in the publication of MNGIE disease. The methodology involved data collection, article screening, gender determination using the Namsor app, statistical analysis using R software, and visualization of findings through graphs created with DataWrapper. Our study utilized PubMed as the primary data source, covering the period from 1993 to 2022, and included 224 articles. The findings revealed that 57.6% of first authors were male, while 42.4% were female. Furthermore, the analysis of gender trends based on countries revealed that the Netherlands had the most favorable gender ratio. It revealed a significant association present between the first author's gender and country. Additionally, selected journals exhibited a favorable gender ratio, with a 1:1 female-to-male ratio in nine out of ten journals examined. ARIMA model predicted that by 2027, approximately 160 publications would have male whereas around 120 publications would have female first authors. Our study highlights the gender discrepancies in first authorship within the context of MNGIE publications and provides insights into the representation of women in medical research. Efforts should be made to address these inequalities and promote gender equality in scientific publishing.

Keywords: First author, Gender parity, Gender ratios, Gender representation, Gender trends, Mitochondrial neuro gastrointestinal encephalopathy, MNGIE

INTRODUCTION

Mitochondrial neuro gastrointestinal encephalopathy (MNGIE) is a rare autosomal recessive genetic condition, caused by thymidine phosphorylase (TP) deficiency and TYMP mutations.[1] MNGIE affects multiple systems including but not limited to gastrointestinal tract, respiratory tract, peripheral nervous system (PNS), central nervous system (CNS), endocrine system, eyes, ears, and heart. The disease is characterized by a steady decline in gastrointestinal function associated with leukoencephalopathy, ptosis, ophthalmoplegia and lower limb muscle weakness.[2]

Academic publications are of paramount importance as they facilitate the advancement of knowledge. There has been a notable increase in women neurologists in the past few years, but there are imbalances regarding publication

proportion between men and women, even more so in terms of subspecialties within the field. Gender inequalities in scientific publications can be attributed to several factors, including: access to resources, institutional barriers and biases, work life balance, stereotypes, implicit biases.[3]

Eliminating gender inequalities in scientific publishing requires systemic change and collective efforts. This includes promoting inclusive practices, diversifying editorial boards, providing guidance and support, implementing transparent and impartial evaluation processes, and ensuring work-life balance and opportunities for all researchers. This includes creating policies that support equality.

In this study, we aimed at analyzing gender trends of the first author in publication related to mitochondrial neuro gastrointestinal encephalopathy (MNGIE).

Aims and objectives

To analyse gender trends of first author in publications related to mitochondrial neuro gastrointestinal encephalopathy (MNGIE) from PubMed indexed publications from 1993 to 2022, based on country and year, and assess gender parity in authorship of medical research.

METHODS

The present study was a cross-sectional study aimed at analyzing the gender trends among first authors of research papers related to MNGIE disease published in PubMed. The primary data source for this study was PubMed, which was utilized as a search tool to gather relevant research publications. The data collection period for this study spanned from January 1st, 2003 to December 31st, 2022. Publications from the year 2023 were excluded due to the limited number of available articles (covering a four-month period) at the time of analysis. However, articles accepted in 2022 but published and appearing on PubMed in 2023 were included to ensure a comprehensive analysis of the most recent publications within the specified timeframe.

After applying the specified filters, a CSV file containing 224 entries was downloaded for further analysis. Inclusion criteria considered all articles related to MNGIE, including those with the phrase "MNGIE" in the title. The full names of the first authors and their country of affiliation were used to identify the gender of the authors. The country was determined based on the author's institutional affiliation.

To identify the gender of the first author, the Namsor application programming interface was employed.[4] The Namsor app is a data analytics tool that predicts the likely gender associated with a given name using machine learning algorithms. It considers cultural and regional naming patterns, linguistic characteristics, and historical trends to provide a probabilistic estimation of an individual's gender. Baobeid et al and Sebo at al have previously used Namsor as a gender determination tool with good results.[5,6]

The statistical analysis of the collected data was performed using the R software. Additionally, an auto regressive integrated moving average (ARIMA) model was applied to explore trends and patterns related to first author gender equality over time. Data visualization was enhanced using DataWrapper, a data visualization tool that allowed the creation of graphs and visual representations. Fisher's exact test was performed to assess the significance of the association between gender and country variables.

RESULTS

In our study, a total of 224 articles were considered. It was found that overall, there were 129 (57.6%) male first authors and 95 (42.4%) female first authors.

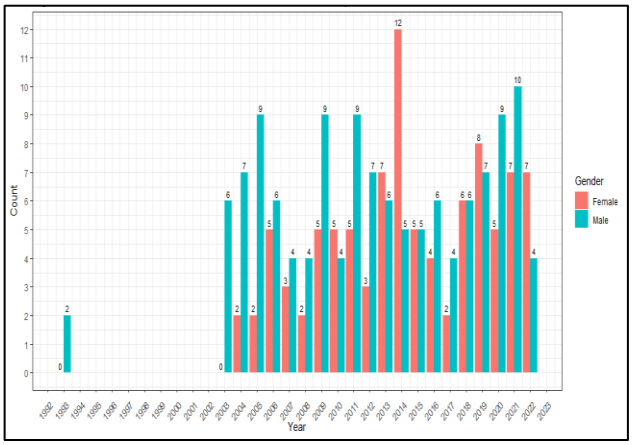

Figure 1: Total number of male and female first authors each year.

Figure 1 shows the number of male and female authors each year. Maximum number of female first author publications about mitochondrial neuro gastrointestinal encephalopathy was in the year 2014.

Figure 2a and 2b shows the prediction of publication trends of male and female first authors for the next 5 years, with modelling data taken from 2003 to 2022. An estimated number of 160 publications by male first authors and 120 publications by female first authors was predicted by the ARIMA model.

Figure 3 shows the gender trends in publications from the year 1993 to 2022 based on countries. The gender ratio was found to be most favorable in the Netherlands with a gender ratio of 4:1 females to males and least favorable in France with a gender ratio of 5:9 females to males.

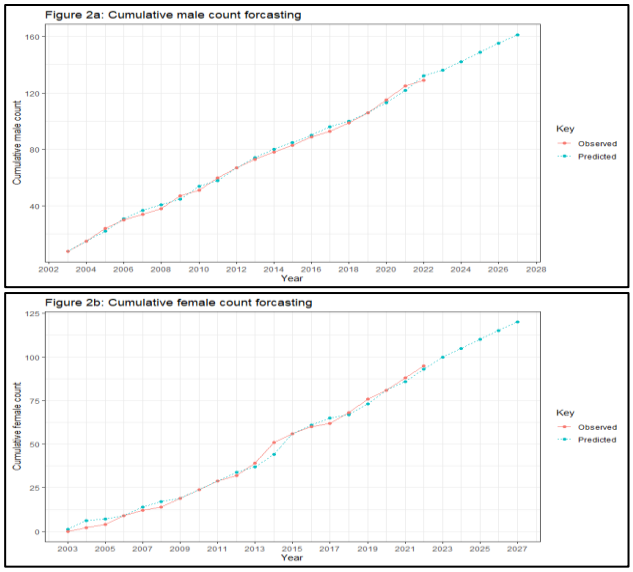

Figure 2: Observed publication trends among cumulative male count (a) and cumulative female count (b) first authors from 2003 to 2022 and prediction of trends for the next 5 years.

*The modelling data is taken from 2003 to 2022; the Forecasting is done from 2003 to 2027.

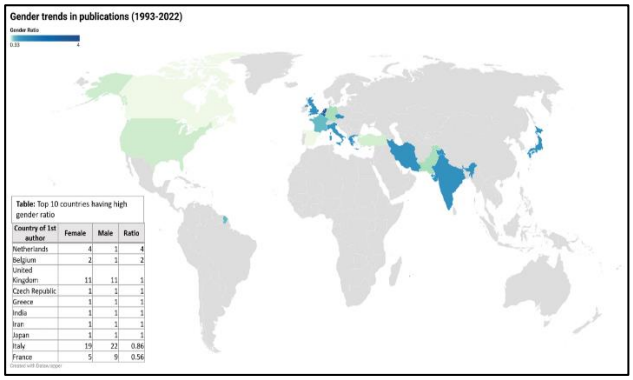

Figure 3: Female:male gender ratio among author country of affiliations.

Table 1: Top journals having favorable gender ratio.

Journal/Book	Female	Male	Ratio
Neurology	3	4	0.75
Annals of Indian Academy of Neurology	1	1	1
BMJ Case Reports	1	1	1
Case Reports in Gastrointestinal Medicine	1	1	1
Clinical Neurology and Neurosurgery	1	1	1
Gastroenterology	1	1	1
Gene	1	1	1
Gene Therapy	1	1	1
Human Gene Therapy	2	2	1
International Journal of Molecular Sciences	1	1	1

Table 1 shows the top journals having favorable gender ratios, with the female to male ratio being 1 in 9/10 journals.

Fisher's exact test was performed between gender and country variables; it was observed that there is a significant association present between the first author's gender and country (p value =0.001499).

Table 2: Top countries having high gender ratio.

Country of 1st author	Female	Male	Ratio	Total
Netherlands	4	1	4	5
Belgium	2	1	2	3
Czech Republic	1	1	1	2
Greece	1	1	1	2
India	1	1	1	2
Iran	1	1	1	2
Japan	1	1	1	2
United Kingdom	11	11	1	22
Italy	19	22	0.86	41
France	5	9	0.56	14

Table 2 shows the top countries having the higher gender ratio. The gender ratio was found to be highest in the Netherlands with 4 female first authors followed by Belgium with 2 female first authors.

Table 3: Top journals having high gender ratio.

Journal/Book	Female	Male	Ratio	Total
Methods in Molecular Biology	3	1	3	4
Brain: A Journal of Neurology	2	1	2	3
Journal of Biological Chemistry	2	1	2	3
Orphanet Journal of Rare Diseases	2	1	2	3
Journal of Clinical Medicine	3	3	1	6
Human Gene Therapy	2	2	1	4
Journal of the Neurological Sciences	2	2	1	4
Annals of Indian Academy of Neurology	1	1	1	2
BMJ Case Reports	1	1	1	2
Case Reports in Gastrointestinal Medicine	1	1	1	2

Table 3 shows the top journals having the highest gender ratio. The gender ratio was observed to be highest in the Journal of Molecular Biology and Methods, with 3 female first authors to 1 male first author. Furthermore, the

gender ratio was lowest in Journal of Clinical Medicine, Human Gene Therapy, and Journal of the Neurological Sciences, Annals of Indian Academy of Neurology, BMJ Case Reports, and Case Reports in Gastrointestinal Medicine with all these journals having a ratio of 1:1 female to male first authors.

DISCUSSION

This study sheds light on the gender discrepancy regarding first authorship concerning MNGIE in neurology. We uncovered several vital findings upon analysing 224 papers published from '1993 to 2022'.

It was noted that the number of publications by female first authors was 95 (42.4%), whereas those of male authors were 129 (57.6%). This comes in tandem with a study led by Nguyen to study gender gaps in neurology research authorship as a whole, who used a similar gender API tool and compiled the data to assess gender trends in authorship for various international neurology journals, concluded that 34.1% of the total authors were female.[7]

We found that the highest number of yearly publications by women was 12 in the year 2013. This could be due to the overall limited number of women in the field of neurology itself.

Historically, publications in neurology had been dominated by men, which could be the subsequent cause for the observed authorship trends in MNGIE specifically, as well. However, these customs are transforming as our study reveals an increasing trend in the number of female authorships. This data is supported by a study conducted by Dubey et al, which narrates the revolution of upward trends in female authorship, especially in developing countries, in high-impact neuroscience journals.[8]

The country with the highest gender ratio of 4 (75%) was the Netherlands, followed by Belgium with a gender ratio of 2 (50%). This can be justified by a study conducted by Takayanagui et al, where they concluded an increase in female participation in overall neurology articles in Brazil, while Dubey et al, focused on the upward trends in a developing country, such as India.[8,9]

The journals taken into consideration in our study with the highest gender ratio of 3 (66.6%) was Methods in Molecular Biology, followed closely by the journals Brain: A Journal of Neurology, Journal of Biological Chemistry, and Orphanet Journal of Rare Diseases with a gender ratio of 2 (50%). According to a study of a similar nature by Filardo et al, which examined the prevalence of female first authorship across journals of various fields within medicine, the British Medical Journal (BMJ) had the highest overall proportion of female first authors, while The New England Journal of Medicine (NJEM) had the lowest proportion.[10]

Future forecast trends predict about 120 (42.9%) papers will have first authors as female in contrast to about 160 (57.1%) papers from male first authors by the year 2027. This foresight can be correlated to a study pioneered by Nickels et al, on gender equality in neurological research related to epilepsy, where a female authorship ratio of 49.2% is predicted for the year 2026.[11] Notably, a contrasting trend is predicted in the field of urology which predicts a monumental rise of 83% in female first authorship by the year 2049, as observed by Rickard et al.[12]

The overall trend of underrepresentation of women in the field of neurology and subsequently in MNGIE research, can be credited to various causes. The most striking factor may be the persistent gender bias despite the increasing number of women entering the field, as claimed by Galloway et al.[13] She emphasized the gender pay gap is one of the highest in the field of neurology (24%) and also informed that one-third of the top 12 medical schools require maternity leave to be taken through disability coverage and/or sick benefits. Silver et al, has also cited the prejudice in funding, recognition, and promotion of gender-related disparities in neurology, and further listed workplace harassment as a notable cause.[3]

Moore et al, suggested that burnout rates are one of the highest in the field of neurology, with women being the more prominent targets, with the aforementioned causes of gender disparity in this article further precipitated burnout. Women with more children presented with a decreased likelihood of wanting to become a physician again.[14]

McDermott et al, explored gender differences in academic ranks and publications in top-ranked neurology programs in the US. He disclosed that men outnumbered women at all faculty ranks, and the discrepancy increased with advancing rank. Men had more publications than women at all ranks, while the gap narrowed with advancing rank.[15]

While the trends thus put forth in the present study are encouraging, a gender disparity remains. Institutions/journals must help address the concerning foregoing factors and strive for gender parity.

While the present study offers a comprehensive analysis regarding the gender trends in MNGIE research, there are several limitations to be acknowledged. The present analysis was restricted to relevant data solely from PubMed. Only the first author's data was included since generally, they are the lead authors with the guiding ideology. A limited number of studies and a definitive range of years of publications have been used to refine our findings. Although Namsor is a reliable source, and has been used previously with good results, it is not 100% accurate. While our study provides insights into MNGIE, we cannot make any direct claims on neurology as a

whole, as larger-scale research is a must to draw broader conclusions in the field.

CONCLUSION

Over the last 30 years, there has been a statistically significant upward trend in female first position authorship in publications related to mitochondrial neuro gastrointestinal encephalopathy. Despite this substantial progress towards gender parity, women continue to be underrepresented as first authors in these publications. Increased representation of women in the field of neurology and research is important for both patients and providers, and to ensure better representation in the subspecialties of neurology, as well. These findings also suggest that additional work is needed to recruit more women into the field, along with identifying and addressing the obstacles to academic advancement for female physicians and researchers.

Advancement can be achieved by increasing mentorship of female physicians especially by female preceptors. Guidance from other female researchers could encourage increased participation and further funding to provide adequate resources for women researchers could eliminate obstacles that cause decreased female authorship. More examples of women in neurology and its subspecialties will breed more interest and opportunities among young female students.

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