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The top 100 cited articles in menstrual health among adolescent girls: a citation analysis

G. Alekhyia¹, Dinesh Prasad Sahu² and Priyamadhaba Behera^{3*}

Abstract

Background Menstrual health is an important public health concern where it is still considered a taboo, and adolescent girls often lack knowledge about menstrual health, face limited access to sanitation facilities, and struggle with the affordability of sanitary materials. Every year numerous articles are published; however, only a few of them would be influential in the evolution of a particular field. The number of citations received by an article serves as a quality factor for the impact of the article in a particular field. Citation analysis analyses the relationship between citations received by articles. From the literature search, no citation analysis was conducted on menstrual health. Hence the objective of the study was to identify the articles which received hundred or more citations and also to identify the leading countries, journals, study designs, and departments conducting research on menstrual health.

Methods Citation analysis was done with search terms pertaining to adolescent and menstrual health using Google Scholar as a database in Publish or Perish software. The articles retrieved were exported to Microsoft Excel. Articles that received a hundred or more citations were screened for the type of article, department, and country where the study was conducted. A descriptive analysis of the hundred or more cited articles was done in Microsoft Excel.

Results A total of 982 articles pertaining to menstrual health among adolescent girls were retrieved. There were hundred articles with hundred and more citations pertaining to the menstrual health of adolescent girls. Cross-sectional study design, Obstetrics and Gynaecology department, India and USA countries, and PLOS ONE journal had the most citations in research on menstrual health among adolescent girls. The top ten articles were on menorrhagia, menstrual hygiene practices, Water, Sanitation and hygiene (WASH), stigma on menstruation, and education on menstrual health.

Conclusion The hundred cited articles on menstrual health among adolescent girls were mainly from high-income countries and were of more observational in nature than interventional. Thus, highlighting the need to strengthen experimental studies on the menstrual health of adolescent girls in Lower-middle-income countries.

Keywords Menstrual health, Adolescent girl, Citation analysis

Plain Language Summary

Menstrual health is an important public health entity where menstrual health management remains poor among adolescent girls in lower-middle-income countries. From the literature, it has been observed that there

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is a lack of research pertaining to menstrual health. Research-related performances are evaluated through various objective measures; one of them is the number of citations received by the articles, which implicates the impact of the article in a particular field. Hence the objective of our study was to enlist the articles pertaining to menstrual health on adolescent health, which received hundred and more citations. The most common study design, department, country, and journal were determined from articles that received hundred and more citations. The study results showed that the Cross-sectional study design, Obstetrics and Gynaecology department, India and USA countries, and PLOS ONE journal conducted research with the highest number of articles having hundred and more citations. The top ten articles included research pertaining to domains such as menorrhagia, menstrual hygiene practices, Water, Sanitation, and hygiene (WASH), stigma on menstrual health, and education on menstrual health, which are imperative with respect to adolescent girls' menstrual health. From the current citation analysis, it is evident that there is a need for strengthening research on menstrual health, which will generate evidence-based interventions and help policymakers implement necessary policies for adolescent health.

Introduction

Menstrual health is defined as a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity in relation to the menstrual cycle [1]. Achieving menstrual health means that girls, women, and all other people who experience a menstrual cycle throughout their life course can access timely, accurate, age-appropriate information about menstruation and changes experienced throughout the life course, as well as related to hygiene practices and self-care [1]. Millions of girls and women worldwide experience period poverty, which is described as limited access to menstrual education, period products, or adequate water sanitation and hygiene (WASH) facilities [2]. In adolescent girls, the onset of menstruation is the start of a new phase, posing various issues such as harassment, stigma, and social exclusion. Menstrual health needs of adolescent girls go unmet due to a lack of access to basic services like toilets, poverty, gender inequality, and cultural taboos [3]. Also, menstrual health is imperative to improve global population health, achieve Sustainable Development Goals (SDGs), and attain gender equality and human rights by the year 2030 [4]. Although the current SDG framework does not explicitly mention menstrual health, various targets indirectly contribute to its attainment [5]. For example, SDG 3 focuses on good health and well-being, where providing knowledge about menstrual health and hygiene (MHH) leads to positive sexual and reproductive health outcomes. SDG 6 emphasizes clean water and sanitation, and ensuring facilities with safety and comfort for MHH will help in achieving this goal [5]. Various studies conducted worldwide found that menstrual hygiene practices remained poor in lower-middle-income countries (LMICs) [6]. Also, research pertaining to menstrual health in LMICs was more of participatory, qualitative, and descriptive methods, but a commensurate number of analytic studies have not been performed [6].

Over the years, the research-related performance of universities, as well as that of individual researchers, is increasingly evaluated through the use of objective measures. There is a growing awareness in research communities, government organizations, and funding bodies around the concept of evaluation metrics such as Informetrics, Bibliometrics, Scientometrics, Webometrics, and Altmetrics [7]. Bibliometrics are statistical analyses of books, articles, or other publications. Citation analysis is a commonly used bibliographic method. A citation implies a relationship between a part or the whole of the cited document and a part or the whole of the citing document [8]. Citation analysis is that area of bibliometrics that deals with the study of these relationships. It employs mathematical, statistical, comparison, abstraction, generalization, and logical methods to study citation patterns in scientific journals and papers [9]. Citation classics are highly cited publications identified by the Science Citation Index (SCI) and a publication cited more than 400 times; however, in some fields with fewer researchers, a hundred citations would qualify a work [10]. Although relying solely on citations may not be ideal for assessing the quality of scientific articles, a high number of citations is suggestive of utility by other researchers [7]. Various citation analysis have been conducted across different disciplines, such as Obstetrics and Gynaecology, critical care, orthopedics, dermatological, ophthalmology journals, citation classics in fertility and sterility, Uro-gynaecology, surgery, nephrology, in field of opioids, and in urethral construction [11–20]. However, no citation analysis specifically focused on menstrual health among adolescents was found. This gap in citation analysis represents an opportunity for exploring the existing literature on menstrual health and also contributes to the development of a comprehensive knowledge base on menstrual health and informs future research, policy, and practice in this important area.

Given the importance of the menstrual health of adolescents as a public health issue and the need for more analytic studies, the study aimed to identify and analyze top-cited articles on menstrual health among adolescents. By identifying the articles with more than a hundred citations, the authors aimed to identify key publications and seminal works that have contributed to the understanding of the menstrual health of adolescents, their challenges, and potential solutions over the decades. Also, the authors sought to identify the leading Journals publishing on menstrual health, the standard study designs employed, the departments involved, and the countries involved in research on menstrual health.

Methods

We conducted a citation analysis in the field of menstrual health among adolescent girls to examine the patterns and frequency of citations of published articles.

Bibliometric approach

The top 100 cited articles on menstrual health were identified as of March 2022 using a free, publicly accessible search software named Harzing's Publish or Perish [21]. Publish, or Perish, is a software program that retrieves and analyzes the academic citation data provided by various data sources such as Google Scholar, Scopus, Web of Science, PubMed, etc. The software provides raw citations, analyzes these, and provides different metrics such as h-index, g-index, total numbers of citations, etc. The databases PubMed and Scopus cover only those articles published in Journals indexed with them, and it was reported that Web of Science provides citation counts from the journals listed in ISI Web of Science, thus underestimating the citation counts [22]. A study was conducted on Academic search engines and bibliographic databases (ASEBDS) comparing the sizes of twelve ASEBDS. Results showed that Google Scholar is currently the most comprehensive academic search engine that provides scholarly information with access to peer-reviewed academic journals and grey literature [23]. Publish or Perish software allows one to choose only one search engine or database for article retrieval. Hence, to test the study objectives, the authors have used Google Scholar as a search engine by considering the accessibility, feasibility, and provision of results with more accurate citation counts. We searched the articles using the search terms (adolescent OR adolescence OR puberty' AND 'Menstruation OR menstrual OR menstrual health OR menses' AND 'hygiene OR hygienically OR sanitation OR sanitary) by Google Scholar on Harzing's Publish or Perish V6 software. The retrieval of articles was set at a maximum limit, and a total of 982 articles were retrieved. The results obtained were exported to Microsoft Excel

from the software. Two researchers (AG and DPS) screened all articles independently. The articles had variables such as cites per year, authors, author count, title of the article, year of publication, journal name, and publisher; each article had URLs providing access to them. Manual extraction was done for variables such as country of origin, department conducting the study, and the type of study design by accessing the article URLs. For the variable country of origin, the authors have considered primarily the country where the study was conducted; if data was unavailable, the first author's country was taken as the country of origin, and also countries we have classified the countries into a high-income, lower-income, lower middle income by using World Bank Classification. The variable department was considered from the affiliation of the primary author. The variable study design was considered if mentioned in the article's title; if not, the researchers screened for materials and methods in abstract or full-text articles. In case of any discrepancy final consensus was arrived at after a discussion with the third researcher (PB). Once the data entry was complete, articles that received hundred or more citations were identified. The hundred or more cited articles were categorized as per the study design. All the hundred cited articles were in English language and were included for analysis.

Statistical analysis

A descriptive analysis was performed for articles that received hundred or more citations using Microsoft Excel. Descriptive data were presented in percentage or proportion.

Results

A total of 982 articles related to menstrual health among adolescent girls were retrieved using Publish or Perish software. The publication years ranged from 1910 to March 2022. Of the 982 articles, there were hundred articles that received hundred or more citations. Out of them, five articles received more than 400 citations and hence were considered citation classics [10]. The mean citation score was 212.9 ± 144.4 , and the median of 170 (IQR: 138–246). Out of 982 articles, the minimum citation was one, and the maximum was 1270.

Various domains with Rank one for articles that received 100 or more citations

Cross-sectional study is the most common study design, ranking first, with thirty-four articles having more than a hundred citations, followed by review articles and qualitative study. The Department of Obstetrics and Gynaecology ranked one with twenty-six articles, followed by the Department of Community Medicine and School

Table 1 Various domains which stand at Rank 1 for articles that received 100 or more citations

Variable	Rank 1	Total number of articles N = 100, n (%)
Study design	Cross-sectional study	34 (34)
Department	Department of Obstetrics and Gynaecology	26 (26)
Country	India & United States of America (USA)	24 (24)
Journal	PLOS ONE	6 (6)

of public health. The countries India and the USA are ranked first, with 24 articles, each having more than a hundred citations, followed by the United Kingdom and Ethiopia. PloS One is the leading journal that published six articles with more than a hundred citations, followed by BMJ Open and Obstetrics and Gynaecology (Table 1).

Characteristics of top ten articles with more than 100 citations

The top ten articles were in research pertaining to menorrhagia, menstrual hygiene, stigma pertaining to menstrual health, WASH, and education on menstrual health.

Citation classics: the topmost article received 1270 citations, assessed menstrual blood loss using a pictorial chart, and was published in BJOG: An International Journal of Obstetrics and Gynaecology journal in the year 1990; the department of Obstetrics and Gynaecology conducted the study. The study has measured the diagnostic accuracy of a pictorial chart in assessing menorrhagia. The article which ranked second had 639 citations, titled Menstrual Hygiene: how hygienic is an adolescent girl? This article was published in the Indian Journal of Community Medicine. The study was a cross-sectional study conducted in India by the Department

Table 2 Characteristics of top 10 articles having citations of more than 100 citations

Rank	Article title	Menstrual health domain	Citations	Publication year	Journal	Country
1	Assessment of menstrual blood loss using a pictorial chart [24]	Menorrhagia	1270	1990	BJOG: An International Journal of Obstetrics and gynecology	United Kingdom
2	Menstrual hygiene: how hygienic is the adolescent girl? [25]	Menstrual hygiene	639	2008	Indian Journal of Community Medicine	India
3	Determination of blood loss [26]	Menorrhagia	514	1964	Scandinavian Journal of Clinical and Laboratory Investigation	Sweden
4	Menstruation in girls and adolescents: using menstrual cycle as a vital sign [27]	Menstrual hygiene	493	2006	Pediatrics	USA
5	Antifibrinolytic for heavy menstrual bleeding [28]	Menorrhagia	411	2000	Cochrane database of systematic reviews	New Zealand
6	Treatment of menorrhagia during menstruation: randomized controlled trial of mefenamic acid and tranexamic acid [29]	Menorrhagia	384	1996	BMJ open	Ireland
7	Menstrual hygiene: Knowledge and practice among adolescent schoolgirls of Nagpur district [30]	Menstrual hygiene	379	2011	Journal of the clinic and diagnostic research	India
8	Where the education system and women's bodies collide: The health impact of girls' experiences of menstruation in Tanzania [31]	Education on menstrual health	357	2010	Journal of adolescence	Tanzania
9	Menstrual practices and reproductive problems: a study of adolescent girls in Rajasthan [32]	WASH	351	2015	Journal of Health Management	India
10	The menstrual mark: menstruation as social stigma [33]	Social stigma on menstruation	341	2013	Sex roles	United Kingdom

of Community Medicine. The third article in the order received 514 citations which also determined menstrual blood loss conducted in Sweden. Fourth in order was a clinical report about the menstrual cycle as a vital sign which received 493 citations. The fifth citation classic was a Cochrane systematic review on antifibrinolytics for heavy menstrual bleeding (Table 2).

Trend analysis of the top hundred cited articles showed that original and review articles shared equal proportions in earlier decades, and an increase in trend was noted in the decade 2011–2020; the proportion of original research increased relatively when compared to review articles in the coming decades (Fig. 1). Most of the top hundred cited articles were cross-sectional studies [34], followed by reviews [25]. There were five experimental studies in the top hundred cited articles; one was quasi-experimental, and the other four were randomized controlled trials (Fig. 2). Out of the top hundred articles, fifty-three were in higher income countries, of which the majority were from the USA [24], and the rest, forty-seven were from LMICs, with India being the major contributor [24]. Out of five experimental studies, four were from higher-income countries, and one was from LMICs (Nepal).

Discussion

The authors conducted a citation analysis to identify articles with a hundred or more citations in the field of menstrual health among adolescent girls published from the year 1910 till March 2022. Several disciplines have conducted citation analysis in the medical field to understand the scientific progress of the field [11–20]. The current citation analysis provides an overview of how research pertaining to menstrual health among adolescents has duly evolved over time. Various databases, such as the Science citation index, Scopus, and Web of Science, have been used in previous studies to retrieve relevant articles [11–14, 18–20]. In the current study, the authors extensively reviewed the literature extensively and identified that Google Scholar, as a search engine provides comprehensive scholarly information that provides access to peer-reviewed journal publications and grey literature. Most of the top hundred cited articles were cross-sectional studies that focused on menstrual hygiene practices among adolescent girls, indicating that research from various countries over the decade has emphasized this aspect. However, there were only five interventional studies that assessed the effectiveness of interventions, such as providing sanitary pads to reduce

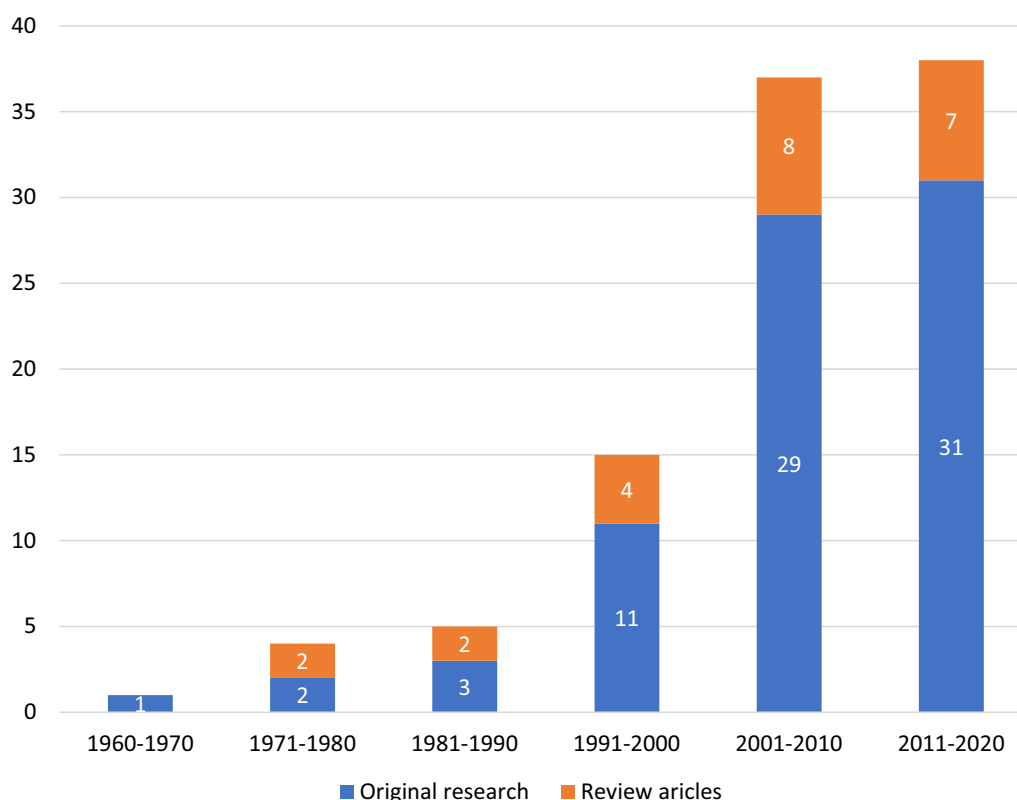


Fig. 1 Top hundred cited articles in research on menstrual health by the decade of publication

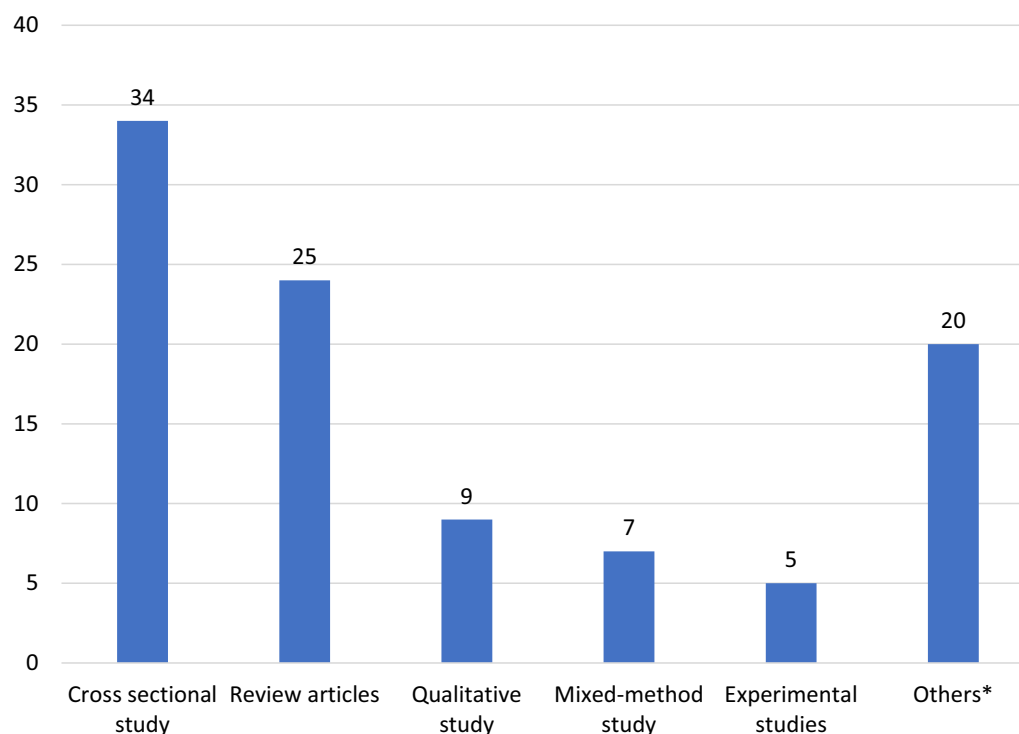


Fig. 2 Top 100 cited articles categorized based on study design. *Others include cohort study (2), case–control study (1), commentaries, and editorials

school absenteeism and using drugs to reduce menstrual bleeding [29, 34]. These interventional studies were published in high-impact journals such as BMJ Open, highlighting the need for more rigorous methodological interventional studies to improve menstrual health outcomes among adolescent girls.

The Department of Obstetrics and Gynaecology was the top department conducting research on menstrual health among adolescent girls; this finding was expected as gynecologists often specialize in treating menstrual disorders and providing health education on menstrual hygiene. The top journals publishing literature on menstrual health include PLOS ONE, BMJ Open, and the Indian Journal of Community Medicine. However, few articles from these journals were not open-access, suggesting that authors tend to cite articles from journals with high-impact factors even if full-text access is not available [24, 26].

From the current citation analysis, several important findings have emerged. The top ten articles which received more than hundred citations, research were in domains such as menorrhagia, menstrual hygiene practices, stigma on menstruation, WASH (Water, Sanitation, and Hygiene) interventions, and education related to menstrual health. These findings are concurrent with the societal needs regarding menstrual health. Within the

menorrhagia domain, the analysis observed that various aspects, including the determination of menstrual blood loss and the management of menorrhagia through different drugs were prominently featured. This indicates that these citations align more closely with the specific research needs in this area. Among the top ten of the hundred cited articles, the publication years ranged from 1964 to 2008. While citations generally accumulate over time, it is worth noting that the most cited article among the top ten was published in 1990 and focused on assessing menstrual blood loss in the context of menorrhagia. However, the second most cited article, published in the year 2008, introduced a new domain, which is menstrual hygiene. This suggests a shift in focus from menorrhagia to menstrual hygiene in subsequent years. Therefore, it can be inferred that factors beyond time, such as the relevance of research to current needs, play a significant role in citations. It is interesting to highlight that although the journal PLOS ONE ranked first among the hundred cited articles, there were no articles found from the journal in the top ten.

The impact of articles in later years compared to previous years can be observed through citation classics. In the context of citation classics, it has been found that out of five citation classics, three were published in the year 2000. This demonstrates that articles from later years had

a significant impact when compared to previous years. This trend of high impact in later years can be attributed to an increase in original research in the later decades. Similar findings were also noted in a study with respect to low citation numbers and publication period, where the reason stated that this could be due to inefficient research during the timeline [35]. Also, among the five citation classics, two articles were not open access. These two articles focused on the assessment of menstrual loss and were among the most highly cited articles. The lack of open access availability for these articles can potentially limit access to scientific literature.

As per the literature, there was a research gap found in high-income and LMICs, and studies in LMICs were more off descriptive studies than analytical; interestingly, our study results also provided the same evidence. The majority of the top hundred cited were from higher-income countries such as the USA, United Kingdom, and Canada. Although India being a LMIC country, ranked top along with the USA, the studies were more cross-sectional studies, and none of them were interventional studies. Out of five, four interventional studies were from high-income countries. Thus, there is a need to prioritize research in LMICs to improve menstrual health outcomes among adolescent girls. The current citation analysis enlightens on the amalgam of research conducted in menstrual health, which helped in analyzing the most common countries and studies deployed in the research as well as lacunae that can be addressed in the future.

Strengths and limitations

The current citation analysis addressed an important public health entity, menstrual hygiene; as per the literature search, there were no citation analyses done in this field; this is the first citation analysis that provides an overview of various countries and departments conducting the research pertaining to menstrual health. The analysis included articles without limiting to a year of publication, and all types of articles were included, which included narrative reviews, cross-sectional studies, interventional studies, and mixed-method studies.

The study has certain limitations that should be acknowledged. It is recommended to use more than one search engine or database [36]. However, we were constrained to use only Google Scholar due to the limitations of the Publish or Perish software, which allows the use of only one search engine or database. It is essential to note that databases such as PubMed, Scopus, and Web of Science have distinct advantages over Google Scholar when it comes to ensuring the quality and reliability of the included articles. During future citation analysis, it is better to incorporate multiple

databases, to ensure a comprehensive and robust analysis of the literature. Additionally, citation analysis has its own limitations. The effect accessibility of articles can influence the citation counts. Moreover, the concept of the Matthew effect introduces bias, as—high-impact journals and articles by eminent scientists tend to receive more citations when compared to unknown researchers or articles published in low-impact journals [37]. It is important to note that high citation counts are not always a measure of quality and can even be attributed to negative examples. Further ethnic biases may exist due to the similarity of study participants. To gain a deeper understanding and perform a more comprehensive analysis of the articles, further bibliometric analysis can be conducted.

Conclusion

In the present citation analysis, descriptive analysis was conducted on articles with a hundred or more citations in the field of menstrual health. Among the hundred and more cited articles, India and USA countries, PLOS ONE journal, Obstetrics and Gynecology department, Cross-sectional study design ranked first pertaining to menstrual health among adolescent girls. The top ten articles encompassed various areas of menstrual health, such as menorrhagia, menstrual hygiene practices, the stigma associated with menstruation, WASH, and education on menstrual health. The current citation analysis provides valuable insights into the origin and trends of research in the field of menstrual health. The analysis also highlighted that menstrual hygiene practices remain poor in lower-income countries. It emphasizes the need for interventional studies to generate evidence and address the challenges regarding menstrual health in these countries. Strengthening research efforts in lower-income countries and conducting more interventional studies is crucial to improve menstrual hygiene practices and overall menstrual health.

Appendix: Top 100 cited articles on menstrual health among adolescent girls

Rank	Citations	Article
1	1270	Higham JM, O'brien PM, Shaw R. Assessment of menstrual blood loss using a pictorial chart. BJOG: An International Journal of Obstetrics & Gynaecology. 1990 Aug;97(8):734–9

Rank	Citations	Article	Rank	Citations	Article
2	639	Dasgupta A, Sarkar M. Menstrual hygiene: how hygienic is the adolescent girl?. Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine. 2008 Apr;33(2):77	11	339	Janssen CA, Scholten PC, Heintz AP. A simple visual assessment technique to discriminate between menorrhagia and normal menstrual blood loss. <i>Obstetrics & Gynecology</i> . 1995 Jun 1;85(6):977–82
3	514	Hallberg L, Nilsson L. Determination of menstrual blood loss. <i>Scandinavian Journal of Clinical and Laboratory Investigation</i> . 1964 Jan 1;16(2):244–8	12	332	Sumpter C, Torondel B. A systematic review of the health and social effects of menstrual hygiene management. <i>PloS one</i> . 2013 Apr 26;8(4):e62004
4	493	Diaz AM, Laufer MR, Breech LL. Menstruation in girls and adolescents: using the menstrual cycle as a vital sign. <i>Pediatrics</i> . 2006 Nov 1;118(5):2245–50	13	326	Brinton LA, Hamman RF, Huggins GR, Lehman HF, Levine RS, Mailin K, Fraumeni Jr JF. Sexual and reproductive risk factors for invasive squamous cell cervical cancer. <i>Journal of the National Cancer Institute</i> . 1987 Jul 1;79(1):23–30
5	411	Bryant-Smith AC, Lethaby A, Farquhar C, Hickey M, Cochrane Gynaecology and Fertility Group. Antifibrinolytics for heavy menstrual bleeding. <i>Cochrane database of systematic reviews</i> . 1996 Sep 1;2018(6)	14	313	McMahon SA, Winch PJ, Caruso BA, Obure AF, Ogutu EA, Ochari IA, Rheingans RD. 'The girl with her period is the one to hang her head' Reflections on menstrual management among schoolgirls in rural Kenya. <i>BMC international health and human rights</i> . 2011 Dec;11:1–0
6	384	Bonnar J, Sheppard BL. Treatment of menorrhagia during menstruation: randomised controlled trial of ethamsylate, mefenamic acid, and tranexamic acid. <i>Bmj</i> . 1996 Sep 7;313(7057):579–82	15	301	Mahon T, Fernandes M. Menstrual hygiene in South Asia: a neglected issue for WASH (water, sanitation and hygiene) programmes. <i>Gender & Development</i> . 2010 Mar 1;18(1):99–113
7	379	Thakre SB, Thakre SS, Reddy M, Rathin N, Pathak K, Ughade S. Menstrual hygiene: knowledge and practice among adolescent school girls of Saoner, Nagpur district. <i>J Clin Diagn Res</i> . 2011 Oct 1;5(5):1027–33	16	301	Bernstein L, Ross RK, Lobo RA, Hanisch R, Krailo MD, Henderson BE. The effects of moderate physical activity on menstrual cycle patterns in adolescence: implications for breast cancer prevention. <i>British journal of cancer</i> . 1987 Jun;55(6):681–5
8	357	Sommer M. Where the education system and women's bodies collide: the social and health impact of girls' experiences of menstruation and schooling in Tanzania. <i>Journal of adolescence</i> . 2010 Aug 1;33(4):521–9	17	281	Lukes AS, Moore KA, Muse KN, Gersten JK, Hecht BR, Edlund M, Richter HE, Eder SE, Attia GR, Patrick DL, Rubin A. Tranexamic acid treatment for heavy menstrual bleeding: a randomized controlled trial. <i>Obstetrics & Gynecology</i> . 2010 Oct 1;116(4):865–75
9	351	Khanna A, Goyal RS, Bhawsar R. Menstrual practices and reproductive problems: a study of adolescent girls in Rajasthan. <i>Journal of health management</i> . 2005 Apr;7(1):91–107			
10	341	Johnston-Robledo, I., Chrisler, J.C. The Menstrual Mark: Menstruation as Social Stigma. <i>Sex Roles</i> 68, 9–18 (2013). https://doi.org/10.1007/s11199-011-0052-z			

Rank	Citations	Article	Rank	Citations	Article
18	276	Chimbira TH, Anderson AB, Turnbull AC. Relation between measured menstrual blood loss and patient's subjective assessment of loss, duration of bleeding, number of sanitary towels used, uterine weight and endometrial surface area. <i>BJOG: An International Journal of Obstetrics & Gynaecology</i> . 1980 Jul;87(7):603–9	25	247	Zegeye DT, Megabiaw B, Mulu A. Age at menarche and the menstrual pattern of secondary school adolescents in northwest Ethiopia. <i>BMC women's health</i> . 2009 Dec;9(1):1–8
19	275	El-Gilany AH, Badawi K, El-Fedawy S. Menstrual hygiene among adolescent schoolgirls in Mansoura, Egypt. <i>Reproductive health matters</i> . 2005 Jan 1;13(26):147–52	26	246	Chandra-Mouli V, Patel SV. Mapping the knowledge and understanding of menarche, menstrual hygiene and menstrual health among adolescent girls in low-and middle-income countries. <i>The Palgrave handbook of critical menstruation studies</i> . 2020:609–36
20	270	Van Eijk AM, Sivakami M, Thakkar MB, Bauman A, Laserson KF, Coates S, Phillips-Howard PA. Menstrual hygiene management among adolescent girls in India: a systematic review and meta-analysis. <i>BMJ open</i> . 2016 Mar 1;6(3):e010290	27	240	Titus-Ernstoff L, Perez K, Cramer DW, Harlow BL, Baron JA, Greenberg ER. Menstrual and reproductive factors in relation to ovarian cancer risk. <i>British journal of cancer</i> . 2001 Mar;84(5):714–21
21	270	Jasper C, Le TT, Bartram J. Water and sanitation in schools: a systematic review of the health and educational outcomes. <i>International journal of environmental research and public health</i> . 2012 Aug;9(8):2772–87	28	239	Tegegne TK, Sisay MM. Menstrual hygiene management and school absenteeism among female adolescent students in Northeast Ethiopia. <i>BMC public health</i> . 2014 Dec;14(1):1–4
22	266	Oster E, Thornton R. Menstruation, sanitary products, and school attendance: evidence from a randomized evaluation. <i>American Economic Journal: Applied Economics</i> . 2011 Jan 1;3(1):91–100	29	238	Garg S, Sharma N, Sahay R. Socio-cultural aspects of menstruation in an urban slum in Delhi, India. <i>Reproductive health matters</i> . 2001 Jan 1;9(17):16–25
23	253	Thomas SL, Ellertson C. Nuisance or natural and healthy: should monthly menstruation be optional for women?. <i>The Lancet</i> . 2000 Mar 11;355(9207):922–4	30	236	Sommer M, Sahin M. Overcoming the taboo: advancing the global agenda for menstrual hygiene management for schoolgirls. <i>American journal of public health</i> . 2013 Sep;103(9):1556–9
24	249	Mason L, Nyothach E, Alexander K, Odhiambo FO, Eleveld A, Vulule J, Rheingans R, Laserson KF, Mohammed A, Phillips-Howard PA. 'We keep it secret so no one should know'—A qualitative study to explore young schoolgirls attitudes and experiences with menstruation in rural Western Kenya. <i>PloS one</i> . 2013 Nov 14;8(11):e79132	31	230	Dhingra R, Kumar A, Kour M. Knowledge and practices related to menstruation among tribal (Gujjar) adolescent girls. <i>Studies on Ethno-Medicine</i> . 2009 Jan 1;3(1):43–8
			32	230	Adinma ED, Adinma JI. Perceptions and practices on menstruation amongst Nigerian secondary school girls. <i>African journal of reproductive health</i> . 2008 Apr 1;12(1):74–83

Rank	Citations	Article	Rank	Citations	Article
33	229	Das P, Baker KK, Dutta A, Swain T, Sahoo S, Das BS, Panda B, Nayak A, Bara M, Bilung B, Mishra PR. Menstrual hygiene practices, WASH access and the risk of urogenital infection in women from Odisha, India. <i>PloS one</i> . 2015 Jun 30;10(6):e0130777	41	197	Reid PC, Coker A, Coltart R. Assessment of menstrual blood loss using a pictorial chart: a validation study. <i>BJOG: An International Journal of Obstetrics & Gynaecology</i> . 2000 Mar;107(3):320–2
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Bold values indicate the number of citations

Abbreviations

MHH	Menstrual health and hygiene
LMICs	Lower-middle-income countries
MHM	Menstrual hygiene management
WASH	Water, Sanitation, and, Hygiene

Author contributions

PMB conceptualized the study. AG and DPS have searched the literature and conducted and analyzed the study under the supervision of PMB. AG wrote the manuscript with inputs from DPS and PMB. DPS and PMB reviewed the final manuscript. All authors approved the final manuscript.

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Availability of data and materials

All data generated or analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Ethical approval was not sought as it was a review of an existing database.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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