Article DOI: https://doi.org/10.37284/eajhs.6.1.1281

East African Journal of Health and Science
eajhs.eanso.org
Volume 6 Issue 1, 2023
Print ISSN: 2707-3912 | Online ISSN: 2707-3920
Title DOI: https://doi.org/10.37284/2707-3920

EAST AFRICAN NATURE & SCIENCE ORGANIZATION

Original Article

Improving Education and Research in Haematology and Blood Transfusion in Africa: Panacea to Improving the Health and Wellbeing of Patients in the Region

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Article DOI: https://doi.org/10.37284/eajhs.6.1.1281

Date Published:

03 July 2023

Keywords:

Haematology, Blood Transfusion, Education, Research.

ABSTRACT

Africa bears a heavy burden of diverse diseases which includes blood diseases that overwhelm the healthcare system. A multitude of factors were believed to be responsible for this burden and it includes a lack of trained healthcare workforce, multi-disciplinary research on diseases facing the region, and a dearth of advanced diagnostic and clinical services for haematologic disorders. Measures taken to improve the situation includes increased health budgetary spending which had marginally improved. The improvement thus far achieved in haematology and blood transfusion education and research need to be determined. Three databases, namely Google Scholar, PubMed and Core, were searched for literature on haematology and blood transfusion education and research. About 2616 articles were identified, of which 7 articles were included for the review following screening and eligibility assessment by independent reviewers. The articles reviewed revealed that there was a significant improvement in haematology and blood transfusion education and research. This has translated to an improved health workforce, service delivery and research capacity and profile. However, these gains were not quantifiably presented to judge the real progress against any set standards. To fully understand the progress made and the levels that need to be reached, a comprehensive, multifaceted, and multinational study that explicitly explores the improvement measures taken and their consequential outcome is necessary.

APA CITATION

Waziri, G., Abdurrahman, Y., Bukar, A., Bukar, A. A., Aliyu, B. I., & Zakaria, A. (2023). Improving Education and Research in Haematology and Blood Transfusion in Africa: Panacea to Improving the Health and Wellbeing of Patients in the Region *East African Journal of Health and Science*, *6*(1), 187-195. https://doi.org/10.37284/eajhs.6.1.1281.

Article DOI: https://doi.org/10.37284/eajhs.6.1.1281

CHICAGO CITATION

Waziri, Gimba, Yakubu Abdurrahman, Alhaji Bukar, Audu Abdullahi Bukar, Bagudo Ibrahim Aliyu and Abdulgani Zakaria. 2023. "Improving Education and Research in Haematology and Blood Transfusion in Africa: Panacea to Improving the Health and Wellbeing of Patients in the Region". *East African Journal of Health and Science* 6 (1), 187-195. https://doi.org/10.37284/eajhs.6.1.1281.

HARVARD CITATION

Waziri, G., Abdurrahman, Y., Bukar, A., Bukar, A. A., Aliyu, B. I., & Zakaria, A. (2023) "Improving Education and Research in Haematology and Blood Transfusion in Africa: Panacea to Improving the Health and Wellbeing of Patients in the Region", *East African Journal of Health and Science*, 6(1), pp. 187-195. doi: 10.37284/eajhs.6.1.1281.

IEEE CITATION

G. Waziri, Y. Abdurrahman, A. Bukar, A. A. Bukar, B. I. Aliyu, & A. Zakaria, "Improving Education and Research in Haematology and Blood Transfusion in Africa: Panacea to Improving the Health and Wellbeing of Patients in the Region", *EAJHS*, vol. 6, no. 1, pp. 187-195, Jul. 2023.

MLA CITATION

Waziri, Gimba, Yakubu Abdurrahman, Alhaji Bukar, Audu Abdullahi Bukar, Bagudo. Ibrahim Aliyu & Abdulgani Zakaria. "Improving Education and Research in Haematology and Blood Transfusion in Africa: Panacea to Improving the Health and Wellbeing of Patients in the Region". *East African Journal of Health and Science*, Vol. 6, no. 1, Jul. 2023, pp. 187-195, doi:10.37284/eajhs.6.1.1281.

INTRODUCTION

Africa bears a heavy burden of diverse diseases (Gouda *et al*., 2017). Blood diseases are theoretically similar however, their burden on societies is inseparable from socio-economic and cultural factors. Hence, their distribution varies significantly between different parts of the world with Sub-Saharan Africa bearing the largest burden (Roberts et al., 2017). An increase in disease burden affects not just individuals and families but can over-stretch the healthcare system (Tluway and Makani, 2017). A multitude of factors are believed to be responsible for this skewed distribution. In addition to socio-economic and environmental factors, the lack of multi-disciplinary research on diseases facing the region and poor/inadequate training of healthcare workers have also contributed to the problem (Aikins *et al*., 2010; Brown *et al*., 2016).

Further compounding the problem is the dearth of advanced diagnostic and clinical services for haematologic disorders despite the high disease burden in the region contributed by haemoglobinopathies (Lancet Haematology, 2021). Diverse measures were taken to tackle healthcare challenges facing the region and these include increased health budget, improving education and research, doctor-patient ratio, collaboration, and advocacy (Makani et al., 2017; Roberts et al., 2017). Low- and middle-income countries of Africa commit to increased health budgetary expenditure of 15% to achieve universal health coverage by 2030. Although some countries had failed in their commitment, others had attained the target with the remaining countries struggling at various levels to fulfil their pledge (WHO, 2013).

An increase in health spending can translate to improved education/training and research and thus improve patient wellbeing (Bein *et al*., 2017; Hahn & Truman, 2015). More so, medical education has a direct impact on the healthcare system as it resolves workforce crises and improves the quality of services delivered (Greysen *et al.,* 2011). One of Africa's biggest health challenges is blood diseases, namely: Sickle cell disease, blood cancers and anaemia (Luzzatto, 2011; Makani & Roberts, 2016; WHO, 2021). This review was aimed at determining the impact of efforts made by some African governments in haematology and blood transfusion education and research to improve the wellbeing of patients.

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METHODOLOGY

Selection Criteria

The selection criteria were based on the PRISMA Statement 2020. The search was focused on the field of biomedical sciences and was narrowed to the literature on haematology education and research. Research and review articles from all sources with no time restrictions that focus on African countries were included. Non-English articles and those focused on countries other than Africa were excluded.

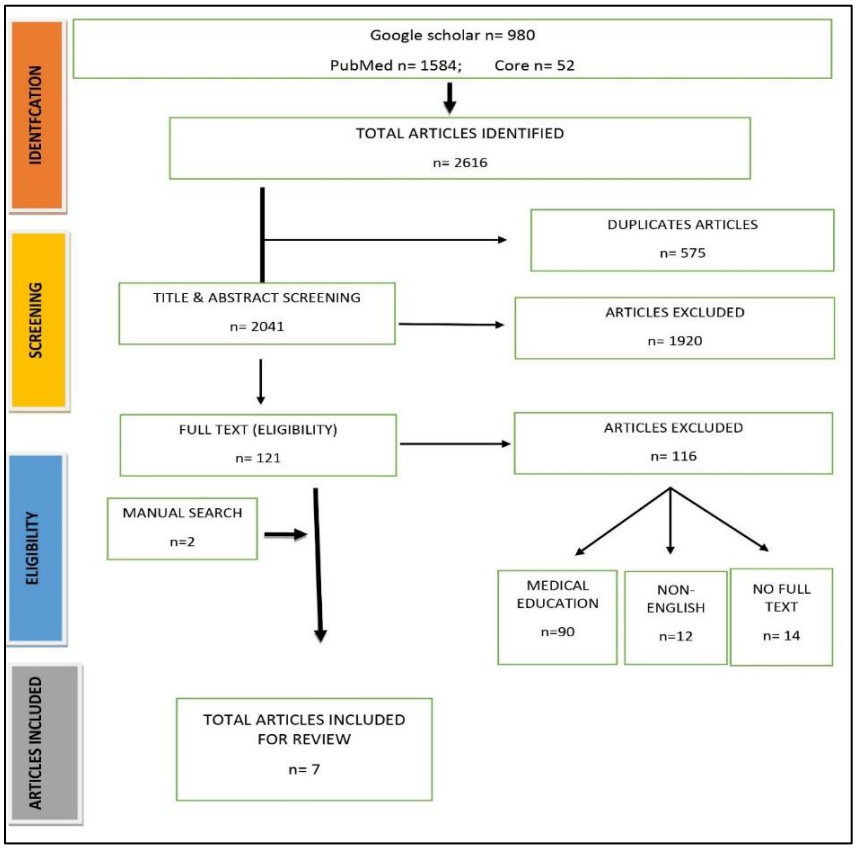
Table 1: Article Review Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Studies on the impact of haematology education and research on healthcare	Impact of general medical education on healthcare
published Articles in academic and peer review journals	Gray literature
Articles in the English Language	non-English articles
Articles on African countries	Non-Africa studies

Search Strategy

For this literature review, a search strategy was developed to identify relevant literature in three selected literature databases, namely: PubMed, Google Scholar, and Core. The keywords used to search the databases were blood transfusion, haematology, education, and research. However, search filters were applied in all the databases. Hand searching was also conducted during the same time frame using the same keywords. Of the 2616 records generated, a total of 2495 data were excluded and 121 records were extracted for eligibility assessment (see *Figure 1*).

Figure 1: PRISMA flowchart



Article DOI: https://doi.org/10.37284/eajhs.6.1.1281

Quality/Eligibility Assessment

This study was based on original research articles and review papers extracted. The search articles obtained were imported into Mendeley reference management software, where it was then exported to a Microsoft Excel spreadsheet. Duplications and non-English articles were identified and removed. Using the title and abstract of the selected articles, the quality and eligibility of each article were carefully studied and evaluated for relevance using the criteria stated above (*Table 1*). Articles were considered eligible, if Non-experimental, on the development of education and research in the field of haematology and blood transfusion in Africa in the past years and published in the English language. We included papers that report practical interventions in the healthcare challenges faced by the African region and improvement or otherwise witnessed. Articles that did not show these characteristics were all excluded. The quality assessment was not done by automation (software) but rather manually by three independent reviewers. To obviate the risk of bias in the screening process, each article was individually reviewed and scored as 1(relevant) and 0 (irrelevant) and articles with a score of 1/3 were excluded while 3/3 and 2/3 were included. A total of 121 out of the initial 2041 articles were extracted after a thorough eligibility assessment.

Data Extraction

Screening and quality assessment of the articles was followed by data extraction by two independent reviewers. The full-text articles were read independently by the reviewers and their eligibility for use in the review was determined based on the set criteria (*Table 1*). Disagreements were resolved through discussion.

RESULT

Study Characteristics

The initial search strategy employed identified a total of 2616 articles, of which 575 were excluded as duplicates and 1920 articles were further excluded as irrelevant. The full-text review further excluded 116 articles leaving only seven articles. The most common reasons for the exclusion were that the studies were largely not directly relevant, non-English articles, and others due to location restrictions and lack of full text. An additional two articles were included from references of the included articles making the total number of eligible articles included for the final review as 7 (Moher *et al.*, 2009).

Characteristics of Included Studies

Articles on the improvement of education and research in haematology and blood transfusion were included. Of the 7 articles included, 6 show advancement in haematology education in terms of workforce, service delivery, infrastructure as well as research in haematology for evidence-based practice, while an article discussed improvement in blood transfusion in terms of human capital development and safety and availability of blood products (Vanitha *et al.*, 2021).

Methodological Assessment

Although the study design of the included articles varied (*Table 2*), they were all non-experimental studies. There were three project reports (Tluway & Makani, 2017; Alison *et al*., 2013; Lubega *et al*., 2018), a descriptive observational study (Rizh, 2018), two cross-sectional studies (Vanitha *et al*., 2021; Makani *et al*., 2017) and a community case study (Buser, 2017). The AXIS Appraisal tool for cross-sectional was found fit to judge the quality and risk of bias of the included studies. The issue of quality common to all the studies was that they lacked clarity in the aim/objectives and findings. Furthermore, with the exception of two studies (Tluway & Makani, 2017; Makani *et al*., 2017), the study setting and outcome measures were not clearly described.

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Table 2: Characteristics of Included Articles

Author	Location (Country)	Study Design	Study Aim	Results
Rizh, 2018	Egypt	Descriptive, observational	Describe the current advancement in haematology	Health workforce and service delivery advancement were slim as only tertiary health institutions and big private hospitals provide special haematology services.
Vanitha *et al.*, 2021	Multinational	cross-sectional study	Assessed the status of training and education of laboratory staff working in blood facilities	Availability of blood transfusion training programs for laboratory staff across 8 African countries, but the need for eLearning emphasises wider coverage.
Makani *et al.*, 2017	Tanzania	Cross-sectional survey	Describe the establishment and impact of postgraduate programmes in haematology and blood transfusion.	Development of human resources in haematology and blood transfusion. About 17 haematology specialists with expertise in health services and research were trained through a self-sustaining medical education programme.
Buser, 2017	Tanzania	Community case study	Describe nurses' speciality training and education need in haematology and haemato-oncology disorders in LMICs	Increased nurses' confidence, respect, and participation in inter-professional team decision-making uplifted.
Tluway and Makani, 2017	Tanzania	Project report	To describe the impact of education and research partnership initiatives for management and control of SCD	Healthcare workforce advancement from a single haematology specialist per country to 17 within a few years,
Alison *et al.*, 2013	Multinational (Ghana and Zimbabwe)	Report	To develop home-grown expertise in blood transfusion to produce context-specific evidence for practice and policy making	The T-REC partnership programme trained undergraduate and postgraduate students, their supervisors as well as transfusion service professionals in blood transfusion research.
Lubega *et al.*, 2018	Uganda	Report	To build a critical mass of PHO specialists through local training and accreditation in SSA	The quality of health service delivery significantly improved. There was decreased mortality and improved prognosis.

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Impact of Improving Education and Research

Strengthening haematology and blood transfusion through education, training, and research has a direct impact on patient health and wellbeing. The possible impacts of such interventions were categorised into themes (*Table 3*) which could be clearly measured using a modified framework for monitoring health systems performance (WHO, 2010).

Health Service Delivery

Improvement of patient wellbeing can be achieved via the establishment and equitable distribution of healthcare facilities. Although not equitably distributed, the included studies showed an increase in haematology and blood transfusion facilities for routine diagnostic/clinical services in urban areas (Rizh, 2018). An attempt to equitably distribute the facilities to regions with higher patient populations was unfortunately skewed to urban areas (Makani *et al*., 2017). This infrastructural expansion was, though without considering other determinants, claimed to have improved patient quality of life and population growth (Lubegu *et al*., 2018; Makani *et al*., 2017). Despite the significant progress in the establishment of routine haematology facilities, with the exception of one (Rizh, 2018), all included articles were silent about specialised facilities such as stem cell transplantation, bleeding disorders, oncology, and genetics centres for advanced clinical and diagnostic services (Rizh, 2018; Vanitha *et al*., 2021; Makani *et al*., 2017; Buser, 2017; Tluway and Makani 2017; Alison *et al*., 2013; Lubega et al., 2018). Blood is an essential therapy for anaemia, for whose quality and safety, a long-term expanded training program was launched for all clinical cadres (PEPFAR). Rizh (2018) showed safety attainment by screening for TTIs using advanced methods. However, Vanitha *et al.* (2021) reported training programs for blood bank staff, but no impact of such a series of training was reported.

Health Workforce

A few local and several different international partnership programs have, over the years, improved the number and quality of the health workforce across all cadres to provide quality haematology services (Rizh, 2018; Vanitha *et al*., 2021; Makani *et al*., 2017; Buser, 2017; Tluway & Makani, 2017; Alison *et al*., 2013; Lubega *et al*., 2018). However, haematologists and nurses have benefited more to the detriment of other health workers with an exclusive haematology fellowship which enriched the haematologist's enrolment register (Makani *et al*., 2017). Such improvement has been achieved via different short- and long-term programmes (Rizh, 2018; Vanitha *et al*., 2021; Makani *et al*., 2017; Buser, 2017; Tluway & Makani, 2017; Alison *et al*., 2013; Lubega *et al*., 2018). A long-term program which awards postgraduate degrees certificates has produced a large chunk of haematologists (Makani *et al.*, 2017), while others were short-term foreign-sponsored programs (Lubego *et al*., 2018; Vanitha *et al*., 202l; Bursa¸ 2017).

Clinical practice has now shifted to evidence-based and data generated through research from a patient population are nowadays used for the same patient population (Izet *et al*., 2008). Research culture, capacity, and profile of the region have sharply improved with overseeing partnership (Rizh, 2018; Vanitha et al., 2021; Makani *et al*., 2017; Buser, 2017; Tluway & Makani, 2017; Alison *et al.*, 2013; Lubega *et al*., 2018). High-quality researches in the included article were usually externally funded and were principally led by postgraduate students as part of their programmes (Rizh, 2018 Tluway & Makani, 2017). The increase in research culture has raised the publication status of the region (Rizh, 2018). Despite a commitment to universal health coverage by African countries, visible improvements in haematology and blood transfusion were only made possible with the assistance of international partnerships. Local effort in strengthening research and education has attracted foreign sponsorship (Makani *et al*., 2017), and as a result, many oversee partners are assisting in haematology education and research (Lubegu *et al*., 2018; Vanitha *et al*., 2021, Bursa 2017).

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Table 3: Categories of Impact Reported in Studies Included

Health service delivery	Health workforce
Number of haematology clinics	Number of haematology specialist
Number of advanced diagnostic centres	Number of haematology programs
Number of haematology sub-specialist centres	Research profile and capacity
Safety and quality (blood transfusion)	Partnership and collaboration

DISCUSSION

Following thorough screening and eligibility assessment, 7 articles were finally included for the review. Of these, very few articles explicitly explored education and research in blood transfusion. There were articles on multinational studies, but they were usually restricted to a few numbers of nations, and that could make the result un-generalisable. Most of the included studies do not report in explicit terms (measurable) the impact of education and research improvement. This review summarised the status and impact of haematology and blood transfusion education and research on healthcare and patient wellbeing. Improving haematology education had yielded a significant impact on the health workforce, and that translates to quality service and, ultimately, patient wellbeing. However, most of the programs that produced the workforce were unsustainable short-term partnership programs and largely concentrated in urban centres. It should have been fairly distributed to the other primary and secondary healthcare, at least for early identification and referral of blood diseases and avoidance of case mutilation. The treatment plan for any disease is based on proper diagnosis; there was noticeably less preference for certain segments of the workforce responsible for laboratory diagnosis. Furthermore, the trained workforce needs facilities to work in, and less reference was also made to this issue in the included articles, but an inequitable distribution of advanced clinical and diagnostic centres in urban areas was reported by a study by Rizk (2018). There were a few high-quality haematology research works as part of postgraduate programmes, but its replica outside the academic programme was not reported.

Improving blood transfusion knowledge and skills results in preventing avoidable human errors that may cause serious consequences. There were diverse training programmes reported on blood transfusion across the region. The programmes were designed by Blood Services and Blood Bank, unlike the traditional academic setting. However, both short-term on-the-job and long-term training programmes were available for laboratory and other medical staff, with certificates being awarded upon completion of the programme. However, the measurable impact of these programmes was not reported. Research in blood transfusion is essential for practice and policy-making. The capacity and culture of research had received a boost through a partnership which trained and funded high-quality research addressing the high-priority needs of transfusion services. The research cut across cadres conducted by students, professional workers, as well as institutions. There has been a significant advancement in haematology education and research and its consequential improvement in workforce and service delivery. The included articles did not explicitly express these impacts in a quantifiable means so that it can be judged against a standard to determine the level of progress. Moreover, these impacts were largely a result of non-governmental foreign partnerships, which are unsustainable.

Although not quantifiably presented, the outcome of this review corroborated a similar finding that also showed improved workforce and service delivery. However, their outcome was attributed to postgraduate medical education (medicine), which does not include other health professions (Talib *et al*., 2019). Research has been identified as a priority tool in solving healthcare challenges. Although this review showed improvement in the research culture, capacity, and profile of all cadres however, Kanmounye *et al.* (2020) confirmed that these gains are short-lived as they are largely

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under short-term foreign-funded partnership programmes.

CONCLUSION

This review analysed the literature on the improvement of haematology and blood transfusion education and research, an area infrequently explored in medical research. The review identified two broad themes in relation to the outcomes of education and research in haematology and blood transfusion. Advancement has been made in these two areas, which has resulted in improved service delivery and workforce. However, haematology and blood transfusion services are very limited in many countries of the region, and many countries in the region could not meet the WHO target of one haematologist per 100,000 population. In addition, there are a few centres that provide specialised care, like stem cell transplantation, haemato-oncology, and blood transfusion. To fully understand the gaps, a comprehensive, multifaceted, and multinational study that explicitly explores the intervention and its consequential impact is required.

Limitations

The present review systematically summarises the improvement in haematology and blood transfusion education and research. The main limitation of this review was that gray literature and African databases were excluded and as a result of which, most relevant articles might have been missed. Articles found in the indexed databases were mostly on medical education and research, generally with little reference to haematology and blood transfusion. With the language restriction filter employed, potentially relevant articles might have been missed. Very few of the included articles explicitly explored the outcome of the improvements in a quantifiable way.

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