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Bibliometric Analysis of Blood Donor Studies in Saudi Arabia: Determining the Research Gaps

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Abstract

Background and Objectives: Research pertaining to blood donors is ongoing in contributing to evidence-based practice to improve patient safety. This article evaluates publication trends in blood donor studies in Saudi Arabia benchmarked against the United Kingdom (UK), a global leader in transfusion practice and research, to identify research priorities for Saudi transfusion services.

Materials and Methods: An online retrospective analysis of publications relating to blood donor studies in Saudi Arabia and the UK, indexed by the Science Citation Index expanded database of *Thomson Reuters Web of Science*. Analysis was performed to compare the quality of research outputs, determine differences in research themes and identify research gaps.

Results: Comparative analysis of research outputs between the two countries highlighted variations in research interests and scientific impact. The UK produced more blood donor studies focusing on donor screening for emerging infectious diseases. Articles were mostly published in transfusion specific journals, resulting in greater visibility and more citations. Comparatively, Saudi blood donor studies tended to focus on donor screening for World Health Organization (WHO) recognized infectious agents, and were mainly published in local Saudi journals.

Conclusion: The greater ability of the UK to identify emerging threats to the blood supply is likely a result of the centralization of their transfusion services which has enabled enhanced epidemiological surveillance and collation of donor information and statistics. We advocate for establishing a centralized Saudi blood transfusion service to enable country-wide blood donor surveillance, trend analysis and to improve the services and research outputs of Saudi Arabia.

Keywords: Saudi Arabia; Blood donor; Transfusion; Research

Introduction

The provision of a safe blood supply for clinical transfusion is an integral part of any healthcare system. Selective donor recruitment and donation screening are the most critical elements of the transfusion chain in safeguarding the blood supply against the transmission of life-threatening infections [1].

Saudi blood transfusion services (BTS) have made significant progress over the last few decades with currently 250 individual hospital blood banks supplied across the country [2].

Research pertaining to blood donors is on-going in contributing to evidence-based practice in establishing strategies to improve patient safety. However, the quality of its research outputs benchmarked against those of the developed world has not been previously investigated.

Bibliometric analysis of scientific productions enables evaluation of the quality of research outputs [3,4]. In particular, citation analysis provides a crude indicator for the scientific impact and quality of a publication [5]. This study evaluates Saudi publication trends in blood donor studies within the field of transfusion medicine relative to the United Kingdom (UK), a global leader in transfusion practice and research. Determining research gaps will support the identification of research priorities for Saudi transfusion services, to improve the quality of research outputs, and ultimately improve blood safety.

Materials and Methods

This study encompassed an online retrospective analysis of publications produced in Saudi Arabia relating to blood donors (in the context of Transfusion Medicine), and indexed by the Science Citation Index (SCI) expanded database of Thomson Reuters' Web of Science [6].

The study was conducted in January 2015, analyzing publication outputs between 1990 and 2012, allowing two subsequent years for citations of the latest articles. The following keywords were used to produce the dataset: "Saudi Arabia" or "UK" [address] AND "blood donor" or "blood donors" [title]. All articles were retrieved and the data refined to those relating to blood donors. References were rejected if blood donors were used as a control group in studies not linked to transfusion medicine. The final list of citations was reviewed to confirm they satisfied the inclusion criteria.

Results

The total number of UK blood donor publications indexed in the Web of Science between 1990 and 2012 was 133. Fifty one of these publications were excluded on initial screening, leaving a core set of 82 publications for analysis. Within this 22 year period of analysis, publications on blood donor studies was fairly consistent after 1992 (average n=4), with peak publications in 2011 (n=8) and 2005 (n=6) (Figure 1a).

Articles were published across 36 journals, of which 26 (72%) were ISI indexed. The journal publishing the highest volume of UK blood donor studies was Vox Sanguinis (n=22; 27%), followed by Transfusion (n=9; 11%) and Transfusion medicine (n=8; 10%) (Table 1). The average impact factor of the top 5 publishing journals was 9.9.

Journal	2012 Impact Factor	No. of blood donor publications
Vox Sanguinis	2.847	22
Transfusion	3.526	9
Transfusion Medicine	1.259	8
Lancet	39.06	4
Journal of Viral Hepatitis	3.082	3
Total	49.774	46 (56%)
Average	9.9	9.2

Table 1: Top 5 science journals publishing UK blood donor studies.

Comparative analysis of research outputs produced from Saudi Arabia yielded 61 publications that were reduced to a final 55 articles based on the exclusion criteria. Saudi publications over the 22 year period of analysis were less consistent in number, but experienced peak publications in 1991 (n=9) and 2004 (n=6) (Figure 1b).

Articles were published across 23 journals, of which 17 (74%) were ISI-indexed. Local Saudi journals Annals of Saudi Medicine (n=15; 27%) and Saudi Medical Journal (n=9; 16%) published the highest volume of articles, followed by Vox Sanguinis (n=5; 7%) (Table 2). The average impact factor of the top 5 publishing journals was 1.6.

Journal	2012 Impact Factor	No. of blood donor publications
Annals Of Saudi Medicine	1.103	15
Saudi Medical Journal	0.619	9
Vox Sanguinis	2.847	5
Transfusion	3.526	3
Journal of family and community medicine	NA	3
Total	8.095	35(63%)
Average	1.6	7

Table 2: Top 5 journals publishing blood donor studies in Saudi Arabia.

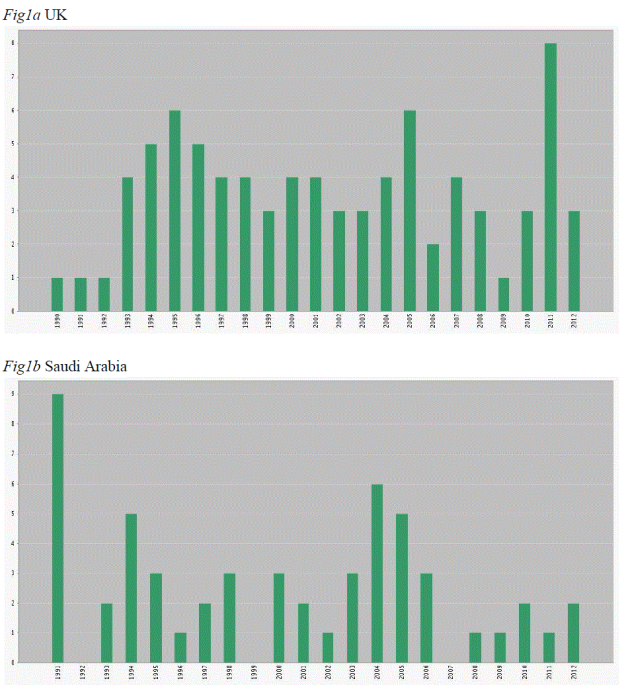

Figure 1: Frequency of publications produced on blood donor studies in the (a) UK and (b) Saudi Arabia between 1990 and 2012.

Table 3 lists the Web of Science output analysis for blood donor studies produced in the UK and Saudi Arabia. The average number of citations for UK publications was 26.26 relative to 7.96 for Saudi Arabia. Additionally, a Hirsch Index (h-index) of 10 was produced for Saudi Arabia, compared with the significantly higher value of 22 for the UK. These parameters indicate a higher quality of publications from the UK.

Parameters	UK	KSA
Results found	82	55
Sum of the Times Cited	2153	438
Sum of Times Cited without self-citations	2126	383
Citing Articles	2007	324
Citing Articles without self-citations	1990	301
Average Citations per Item	26.26	7.96
h-index	22	10

Table 3: Comparative citation analysis of blood donor study research outputs of the United Kingdom and Saudi Arabia between 1990 and 2012.

Publications mapped by research domain

Blood donor studies grouped under three main domains: (i) donor infectious disease screening (IDS), (ii) non-infectious disease screening (non-IDS), and (iii) donor recruitment, retention and behavior patterns (DRRB). IDS research was further subdivided into

screening for 'classical' WHO-recognized transfusion transmissible agents and 'non-classical' emerging infectious agents. Classical WHO-recognized transfusion transmissible agents included Human Immunodeficiency Virus (HIV), Hepatitis B (HBV), Hepatitis C (HCV), Syphilis, Human T-lymphotropic virus(HTLV) I/II, West Nile virus (WNV), and malaria.

IDS accounted for the greatest number of publications in both countries. In the UK, 59(72%) publications covered IDS, of which 16(19%) analyzed emerging infectious diseases. Indeed 3 out of the top 5 cited UK publications were on the topic of emerging threats to blood safety [7-9]. A further 17(21%) articles reviewed non-IDS in blood donors, and a final 6(7%) articles covered topics of DRRB analysis (Figure 2). Comparatively, Saudi publications displayed a slightly different research profile. Forty nine (89%) publications reviewed IDS in blood donors, however, only 4(7%) of these publications analyzed emerging infectious diseases. The remaining 45(82%) publications were on WHO-recognized transfusion transmissible agents. Additionally, 3(5.5%) publications covered non-IDS screening topics, whilst the final 3(5.5%) publications analyzed DRRB (Figure 3).

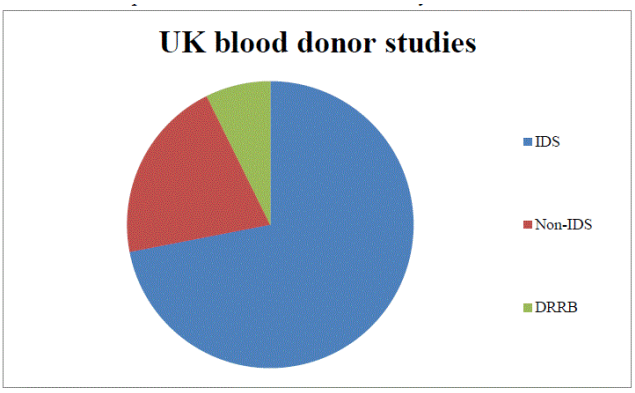

Figure 2: UK blood donor publications/research domain analysis. *IDS, donor infectious disease screening; non-IDS, non-infectious disease screening, and DRRB, donor recruitment, retention and behaviour.

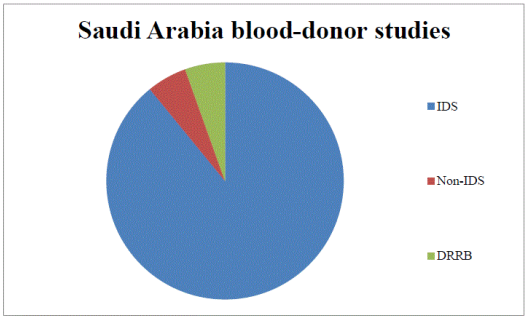

Figure 3: Saudi blood donor publications/research domain analysis. *IDS, donor infectious disease screening; non-IDS, non-infectious disease screening, and DRRB, donor recruitment, retention and behaviour.

Discussion

Saudi Arabia has been producing publications on blood donor studies since the 1990s, with peak publications in 1991 (n=9). However, the volume of research output has not been consistent, with several years where no publications were produced. In comparison, the UK interest in blood donor studies increased after 1992, with an average four publications produced each year, and peak output in 2011 of eight articles (Figure 1). This need to improve the research production of Saudi Arabia has been noted by others [10]. However, its volume of publications and visibility in certain fields has ranked favourably among neighbouring Arab countries [10-11].

A limitation of the Web of Science database was the inability to search for terms in publication abstracts. This study was therefore limited to publications that mentioned blood donors in the title. Nevertheless, citation analysis of blood donor studies showed a marked difference between the two countries, with the average number of citations per article for the UK estimated at 26.26 relative to 7.96 for Saudi Arabia. These variations are likely the result of the visibility of publications to the research community, as well as topics of investigation. Journal analysis showed that Saudi publication production was mainly from local journals. The Annals of Saudi Medicine and the Saudi Medical Journal published 44% (n=24) of Saudi blood donor studies. UK publications, however, targeted subject-specific transfusion journals. This would likely influence the visibility of UK research activities to the transfusion community and favour greater article citation.

Publication analysis highlighted differences in research patterns between the two countries. Saudi Arabia's research interests focused mainly on donor screening for known infectious agents. However, UK publications focused on donor screening for emerging infectious diseases. In any research field, such 'hot topics' would likely yield greater interest and subsequently more citations. Therefore, improving Saudi Arabia's research initiatives requires a shift towards emerging threats to blood safety, with publications targeting transfusion journals for greater visibility.

It has been noted that UK transfusion services are coordinated centrally through one organization, the National Health Service Blood Transfusion Service (NHSBT), responsible for donor recruitment, donation screening, processing, storing and issuing of blood products. It is plausible to suggest that UK service centralization facilitated the determination of trends in emerging threats to blood safety. This information would be translated directly into improvements to laboratory donor screening algorithms, and revision of donor recruitment and management policies, raising the quality of the national blood supply and strengthening blood transfusion services. However, as blood transfusion services in Saudi Arabia are independent to each hospital, collating donor related information in the near future may present an initial barrier. Nevertheless, as a complete understanding of the national problem precedes intervention strategies, the country as a whole would benefit greatly from establishing a centralized blood service for communication and reporting. These are our recommendations for the future.

Conclusion

This article presents a bibliometric analysis of blood donor studies in Saudi Arabia and the UK. Comparative analysis of research outputs between the two countries highlighted variations in research interests and scientific impact. The UK produced more blood donor studies

focusing on donor screening for emerging infectious diseases. Articles were mostly published in transfusion specific journals, resulting in greater visibility and more citations. Comparatively, Saudi blood donor studies tended to focus on donor screening for classical recognized infectious agents, and were mainly published in local Saudi journals. The greater ability of the UK to identify emerging threats to the blood supply is likely a result of the centralization of their transfusion service which has enabled collation of donor screening information. We advocate for establishing a centralized Saudi blood transfusion service to enable country-wide blood donor surveillance, trend analysis and improve the research outputs of Saudi publications.

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