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Saving Lives through Voluntary Blood Donation: Learning from Medical Students in Ruvuma, Southern Tanzania

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Abstract

Background

Most developing countries like Tanzania are failing to meet the WHO target of 1% of the population to save lives by blood donations. Medical students present high merit potential blood donors due to their medical knowledge, physiological potential by age and a will to volunteer for change. The use of medical students for blood donations has rarely been described in southern Tanzania.

Methods

A cross-sectional study to assess awareness, knowledge, attitudes, willingness and factors associated with blood donation among medical students in Ruvuma, Southern Tanzania was conducted from March to June 2018. A simple random sampling was used to recruit students followed by a roll out of a self- administered questionnaire. Collected data was analyzed by IBM Corp, SPSS Version 24.0 using Chi squares test and independent t-test.

Results

A total of 176 students were assessed at a mean age of 25.8 (± SD 3.6) years. Eighty medical students (45.5%) ever donated blood while among them 66 (82.5%) of those being out of volunteering. Repeated blood donors out of those who had ever donated were 46 (57.5%). Majority of the participants had a positive attitude toward blood donation 159 (90.3%) and 135 (77%) perceived voluntarily donated blood to be the best source of blood for transfusion. A large group of participants 133 (75.6%) were willing to donate in future blood donation events. Factors that were significantly associated with ever donating blood were age above 30 (OR=0.18, p<0.001), male sex (OR=3.69, p=0.001), past HIV screening (OR=2.59, p=0.029), knowledge of one's blood group (OR=4.86, p<0.001,) and knowledge of the safe duration of time taken to donate a unit of blood (OR=2.42, p=0.024).

Conclusion

Medical students present a high awareness, positive attitude, and high intention group to donate blood. They are more willing to volunteer for blood donation which can achieve the WHO goal for non-remunerated blood donation.

Keywords: *Saving Lives, Voluntary Blood Donations, Medical Students, Africa, Tanzania.*

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Introduction

Blood donation is a vital health care practice needed for blood transfusion in a broad range of clinical services like cardiovascular and transplant surgery, massive trauma therapy, hematological malignancies, pregnancy-related complications and severe childhood anemia (1). Unfortunately, there is a challenge for country-level availability of adequate donor blood in most of low and middle income countries (2). The World Health Organization (WHO) estimates that about 108 million blood donations are collected globally every year. Half of the global volume of blood is collected in high-income countries and is to less than 20% of the world's population. Again, the average blood donation rate is 9 times higher in high-income countries than in low-income countries (3).

A minimum demand for blood in any settings states that blood donation from at least from 1% of the population is needed to meet a nation's most basic requirements for blood (4). This is an easier goal to be achieved but surprisingly it has presented a static progress by most of developing countries. Developing countries particularly those in Africa require blood for effective management of pregnancy-related complications, postnatal care, trauma, severe childhood anemia and hematological conditions (5).

For safety of donors, it is recommended that whole blood donated shall not exceed 13% of blood volume: e.g. a donor weighing 45 kg to donate 350 ml and those weighing 50 kg to donate 450 ml (age of 18 to 60 years) (6). With a time frame of 10 to 20 minutes in one setting, repetition can be 12 weeks (3 months) for males and 16 weeks (4 months) for females (7). Unfortunately, there has been a diminishing external support to regional transfusion services in most of sub-Saharan African countries. As a result, the end volume of blood available and safety (8) has remained to be of challenge (9) in achieving the goal of universal health coverage (10).

The above requirement can be met from blood donation, where donors are classified as Voluntary Non-Remunerated Blood Donors (VNRBD), Family replacement, Remunerated / Paid / Commercial / Professional donors, and Autologous Blood Donors (11). However, the safest blood donors are VNRBD from low-risk populations (10). Volunteers aged between 24 and 35 years are considered to give the most effective blood. Majority of them being in secondary school training or colleges (12).

Despite the highest population and highest blood demand in East Africa, Tanzania presents a lowest blood collection units per a population of 1000 people i.e. Tanzania (3.6), Kenya (4.1) and Uganda (6.3) (13). In 2017, Tanzanian National Blood Transfusion Services (NBTS) reported an estimate of only 36% of all blood need being met (14). Main source for blood supply in the hospitals in Tanzania comes straight from donors who were non - NBTS blood banks (15). About 79% of blood collected in Tanzania by NBTS (blood bank) are from VNRBD and the remaining 21% from family replacement (16). Strengthening VNRB campaigns has been continuously recommended for public institutions in Tanzania (17).

One of the most important VNRBD groups are college students based on their age and knowledge (12,18,19). General factors influencing blood donation vary from region to region by attitudes, willing to donate, age, gender, knowing a person who has donated blood, knowledge of the amount of blood donated, willingness to donate in the future, and post-donation reward (20,21). Lately, medical students have presented impressive knowledge, awareness and attitude on blood donation in Africa (22,23). Unfortunately, blood donation from the medical students is not sufficient and raises a questionable internal variations among medical students (24).

The main aim of the study was to assess the knowledge, attitude, willingness for the future blood donation among medical students of southern, Tanzania.

Methods

Study design and setting of the study

The quantitative descriptive cross-sectional study was conducted in Songea town, Ruvuma region of southern Tanzania. The study was institutional based at a Teaching Medical Hospital of Archbishop James University College (AJUCO) at Peramiho Medical Campus (Re-registered at *University of Dares Salaam, Mbeya College of Health and Allied Sciences, UDSM-MCHAS in 2019*).

Sampling and study duration

A frame list of all students attending medical degree training at year 3 to year 5 was created. Special code for each student was created in a list. Medical students who were willing to participate in the study were invited and their codes identified as eligible. All students who were eligible to participate were randomly selected by a simple random sampling technique. Those

who were sampled were requested to give written consent and interviewed using structured questionnaire. Data was collected from 10th March, 2018 to 30th June, 2018.

Eligibility

All medical students who were present and willing to participate in the study were included in the participant's list. All medical students who were absent during data collection, or those who were present during data collection but did not consent for the participation were excluded. Students who participated in the study but did not complete filling of the questionnaire were also excluded from the study.

Data collection tools and Data management

Data was collected by using as self-administered structured questionnaire after a brief description of the opportunity of blood donations from medical students in saving lives. Data on demographic characteristics of students, knowledge of blood groups, knowledge on safety, and knowledge on blood infection risks, knowledge on volume to be transfused, previous experience and interests / willing to donate blood were entered and stored in SPSS database. The summary codes for all participants' ID and variable names were used in data management and analysis. A code book was used to guide investigators on data cleaning.

Analysis

The quantitative analysis of data was done using IBM Corp. SPSS Version 24.0. The description of the proportions for demographic summary, proportions for awareness, knowledge, attitude and willingness for blood donations were done initially. The measures of associations (odds ratio) for ever donating blood and factors associated with willingness to donate blood were analysed at 95% confidence interval using Chi squares test and independent t-test.

Ethics

Ethical review and permission to collect data was granted by the AJUCO - Ethical Review Committee. Information on the design of the study, benefits and chances if there are risks to participate was given in writing. The study pointed out clearly that there are no any anticipated risks and all information shared will be recorded, stored and analyzed with strict confidentiality. The information on data storage and the use of identification codes instead of names was given orally and writing. Informed consent was granted by students before data collection.

Results

From a total of 662 medical students registered at AJUCO. There were 81 students attending clinical training at Sumbawanga Regional Hospital (>300 km away) and 307 students not willing to participate. Finally, a total of 274 medical students (54 from MD2, 120 from MD3, 50 from MD4, and 50 from MD5) were given questionnaires but 98 presented incomplete filled questionnaires.

Demographic characteristics of participants

A final sample of 176 students was available for final analysis. The mean age of medical students was 25.8 (± 3.6) years, ranging from 20 to 44 years. Details of the demographic characteristics are shown in **Table 1**.

Table 1. Demographic Characteristics of the Participants

Characteristics		Frequency (%)
Age group in years	20-24	83 (47.2)
	25-29	69 (39.2)
	30-34	20 (11.4)
	≥35	4 (2.2)
Years of study	Second	40 (22.7)
	Third	81 (46.0)
	Fourth	24 (13.6)
	Fifth	31 (17.6)
Sex	Male	137 (77.8)
	Female	39 (22.2)
Marital status	Single	141 (80.1)
	Married	35 (19.9)
Religion	Roman Catholic Christians	82 (46.6)
	Muslim	32 (18.2)
	Protestant Christians[#]	31 (17.6)
	SDA[‡]	20 (11.3)
	Others[*]	1 (0.5)
Awareness	Had Prior Exposure	148 (84.1)
	Never had Prior Exposure	28 (15.9)
	Motivated for Donation	147 (83.5)
	Not Motivated	29 (16.5)
	Screened for HIV Before	146 (83.0)
	Never Screened for HIV	30 (17.0)
	Thought about Screening	148 (84.1)

[#]Anglican, EAGT, Lutheran, TAG ‡SDA refers to Seventh Day Adventist, [*]Jehovah Witness

Knowledge on blood donation

Majority of the participants 134 (76.3%) knew their blood groups, 96 (54.4%) knew the minimum frequency that a donor should donate per year, 113 (64.2%) had no knowledge on the minimum safe amount of blood volume that should be donated also 126 (71.6%) had no knowledge of amount of time required for blood donation process. The overall knowledge of common blood groups, groups of people that can donate blood and knowledge of TTI's was generally impressive as shown in **Table 2**.

Table 2. Participant's knowledge on blood donation

Characteristics		Frequency (%)
Knowledge on common blood groups	A+	4 (2.3)
	B+	7 (4.0)
	AB+	12 (6.8)
	O+	50 (28.4)
	O-	5 (2.8)
	Positives[†]	46 (26.1)
	All	52 (29.5)
Knowledge on participant's blood group	A+	26 (14.8)
	A-	1 (0.6)
	B+	26 (14.8)
	B-	1 (0.6)
	AB+	13 (7.4)
	AB-	2 (1.1)
	O+	55 (31.3)
	O-	10 (5.7)
	Don't know	39 (22.2)
	Forgotten	3 (1.7)
Knowledge on if blood transfusion infection	knew	170 (96.6)
	Didn't know	6 (3.4)
	HIV Can be transmitted	175 (99.4)
	HIV Can't be transmitted	1 (0.6)
	HCV Can be transmitted	155 (88.1)
	HCV Can't be transmitted	2 (11.9)
	HBV Can be transmitted	170 (96.6)
	HBV Can't be transmitted	6 (3.4)
	Syphilis Can be transmitted	123 (69.9)
	Syphilis Can't be transmitted	53 (30.1)
	Malaria Can be transmitted	99 (56.3)
	Malaria Can't be transmitted	77 (43.8)
Knowledge of the number of	Weekly	2 (1.1)

times that an individual can donate in a year	Monthly	7 (4.0)
	Three monthly	96 (54.5)
	Six monthly	30 (17.0)
	Annually	6 (3.4)
	Others	1 (0.6)
	Don't know	34 (19.3)
Knowledge on safe blood volume donation at one on set	<500ml	63 (35.8)
	500-1000ml	60 (34.1)
	Don't know	53 (30.1)
Amount of time required for blood donation process	20-60minutes	50 (28.4)
	<20minutes	32 (18.2)
	Don't know	94 (53.4)
The use of Men for blood donation	Men can donate	176 (100)
	Men can't donate	0 (0.0)
Knowledge on groups of people that can donate blood	Women can donate	171 (97.2)
	Women can't donate	5 (2.8)
	Healthy can donate	176 (100)
	Healthy can't donate	0 (0.0)
	Young<18 years can donate	16 (9.1)
	Young<18 years can't donate	160 (90.9)
	Old>60 years can donate	8 (4.5)
	Old>60 years can't donate	168 (95.5)
	Diseased can donate	2 (1.1)
	Diseased can't donate	174 (98.9)

† *Respondents who selected all A+, B+, AB+, O+ as the common blood groups which they knew*

Attitude towards blood donation

The attitudes of the medical students towards blood donation were reflecting that blood donation is good for their health by 159 students (90.3%). Again 135 students (77%) perceived voluntarily donated blood to be the best blood source in hospitals as shown in **Table 3**.

Practice of Blood Donation

There were 80 students (45.5%) who donated blood once in their life time. Among those 66 students (82.5%) had an experience of volunteering. Regular blood donation was reported by 46 students (57.5%) as shown in **Table 4**.

Table 3. The Attitude towards Blood Donation

Attitude for Blood Donation		Frequency (%)
General feeling towards blood donation	Good practice	159 (90.3)
	Bad practice	3 (1.7)
	It is a neutral practice	14 (8.0)
Best blood source	Voluntarily blood donation	135 (76.7)
	Family replacement donation	18 (10.2)
	Self-donation	10 (5.7)
	Remunerated /paid donor	3 (1.7)
	Don't know	10 (5.7)
Adverse effects for blood donor during/after donation	There are adverse effects	125 (71.0)
	There is no adverse effects	36 (20.5)
	Don't know	15 (8.5)
Perceived Post blood donation effects	Temporary weakness	134 (76.1)
	Contract infection	13 (7.4)
	Fall sick	3 (1.7)
	All of the above	17 (9.7)
	No effect	1 (0.6)
	Don't know	8 (4.5)

Table 4. Practice of Blood Donation

Practice		Frequency (%)
Previous experience of blood donation (N=176)	Ever donated blood	80 (45.5)
	Never donated blood	96 (54.5)
Reason for donating blood for those who ever donated (N=80)	Voluntary	66 (82.5)
	A friend /relative needed blood	13 (16.25)
	To know my blood status	1 (1.25)
Regular donation (N=80)	Yes	47 (57.5)
	No	33 (42.5)
Donor's frequency (N=80)	<1 time a year	42 (52.5)
	1-3 times a year	17 (21.3)
	>3 times a year	7 (8.7)
	Inapplicable**	14 (17.5)
Willingness to donate blood in future (N=176)	Yes	133 (75.6)
	No	43 (24.4)
Reasons for not being willing donating (N=43)	My religion forbids it	3 (7)
	Need to donate to friend or relative in future	8 (18.6)
	Unfit to donate	15 (34.9)
	Fear of needle	12 (27.9)
	May be donated to others	5 (11.6)

***N=176, includes those who never donated and those who donated only once in their life time*

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Willingness of participation in next blood donation event

Majority of respondents 133 (75.6%) were willing participate in next blood donation events or whenever they are called. The major reasons of not donating blood were; unfit to donate, fear of needle and the need to donate for a friend/relative in future 34.9%, 27.9%, 18.6% respectively Error! Reference source not found..

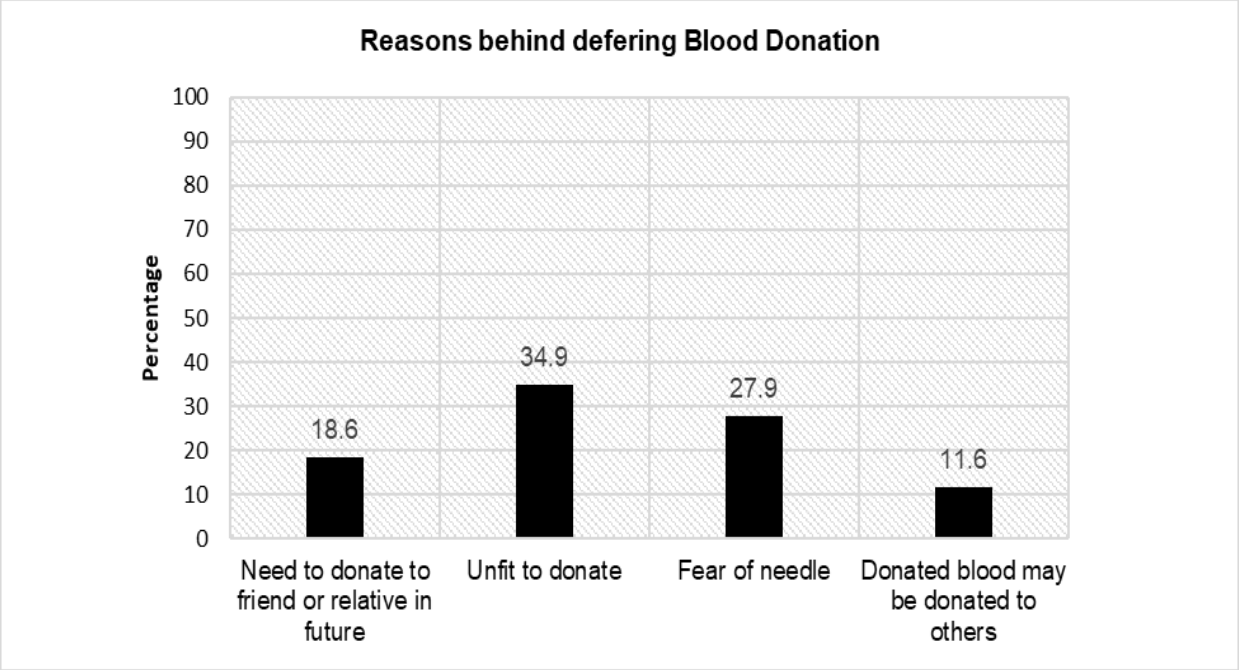

Figure 1. Reasons for Not Donating Blood

Factors associated with Blood Donation

The factors that were associated with blood donation were age above 30 years (OR=0.18, p<0.001). The respondents aged between 20 - 29 years of age were 82% and were less likely to donate blood than those 30 and above. Males were almost four times more likely to donate blood than females (OR=3.69, p=0.001). The past HIV screening contributed to 2.5 more possibilities for blood donation (OR=2.59, p=0.029). Students with knowledge of their blood groups were 2.5 more likely to donate blood than those who did not know their blood group (OR=4.86, p<0.001). Students with knowledge of the safe duration of time of blood donation in one setting were 2.5 more likely to donate blood than those who do not know the safe duration for blood donation (OR=2.42, p=0.024). Details of other factors and their measures of association are shown in Error! Reference source not found.

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Table 5. Factors associated with blood donations

Factors for blood donation		Experience for Blood Donation				
		Ever donated Freq (%)	Never donated Freq (%)	Total (100% for each row)	P-value (α=0.05)	Odds Ratio (95%, Confidence interval)
Age	20-29	62 (40.8)	90 (59.2)	152	<0.001	0.18 (0.06-0.51)
	≥30	19 (79.2)	5 (20.8)	24		
Sex	Male	72 (52.6)	65 (47.4)	137	0.001	3.69 (1.63 - 8.35)
	Female	9 (23.1)	30 (76.9)	39		
Past HIV screening	Ever screened	73 (49.7)	74 (50.3)	147	0.029	2.59 (1.08 - 6.22)
	Never screened	8 (27.6)	21 (72.4)	29		
Knowing own blood group	Knew	73 (54.1)	62 (45.9)	135	<0.001	4.86 (2.09 - 11.28)
	Didn't know	8 (19.5)	33 (80.5)	41		
Knowing safe duration of time for blood donation	Knew	21 (63.6)	12 (36.4)	33	0.024	2.42 (1.10 - 5.29)
	Didn't know	60 (42.0)	83 (58,0)	143		
Academic Level**	Non-clinical	58 (47.9%)	63 (52.1%)	121	0.451	1.281 (0.67-2.43)
	clinical	23 (48.1%)	32 (58.2%)	55		
Exposure of blood donation programs	Exposed	72 (48.6%)	76 (51.4%)	148	0.18	2 (0.85-4.70)
	Not exposed	9 32.1%)	19 (67.9%)	28		
Blood donation motivation	Motivated	72 (49%)	75 (51%)	147	0.076	2.11 (0.91-4.99)
	Not motivated	9 (31%)	20 (69%)	29		
Knowing Safe frequency of donation	know	45 (46.4%)	52 (53.6%)	97	0.913	1.034 (0.57-1.87)
	Didn't know	36 (45.6%)	43 (54.4)	79		
Knowledge on safe blood volume	Know	37 (57.8%)	27 (42.2%)	64	0.018	2.11 (1.13-3.95)
	Didn't know	44 (39.3%)	68 (60.7%)	112		
Attitude toward blood donation	satisfactory	77 (48.4%)	82 (51.6%)	159	0.050	3.05 (0.95-9.76)
	unsatisfactory	4 (23.5%)	13 (51.6%)	17		
Knowing best source of blood	Knew	68 (50.4%)	67 (49.6%)	135	0.036	2.1 (1.04-4.58)
	Didn't know	13 (31.7%)	28 (68.3%)	41		

***All students studied hematology in year 2 (MD2) but levels of knowledge for blood donations increases with clinical exposure from year 3 to year 5*

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Discussion

The medical students from Songea, Ruvuma region of Southern Tanzania presents an opportunity of saving lives by blood donation using educated young people from medical schools as volunteers.

About 86.4% of the medical students from AJUCO were aged 20 - 29 years who were already less likely to donate blood compared to those 30 and above. This is mainly due to high awareness of blood donation and high knowledge of the procedures and benefits of blood donation. The majority of students who were ready from the southern Tanzania were third years, mainly males (77.8%). Majority of students (84.1%) had previous exposure, 83.5% were motivated and 83% were previously screened for HIV.

The medical students from Southern Tanzania described knowing blood group as a key information to facilitate life-saving in hospitals. The proportion of medical students who showed willingness to donate blood found in the southern Tanzania was relatively higher compared to that of 64% from Kilimanjaro, Northern Tanzania that included both medical and non-medical students (12). This level of knowledge is however of lower proportion when compared to reported knowledge of blood groups among medical students from Adama University in Ethiopia (91.4%) (22), and Khartoum, 98.2% (24).

The medical students from Southern Tanzania who knew the minimum frequency that a donor should donate per year were 54.4%, a proportion which is lower compared to that reported from Gondar, Ethiopia in which 67.8% had a correct knowledge on this aspect (23). This implies a need for more blood donation education in medical schools. Our study found that the knowledge of the blood donation duration and past HIV screening were significant factors associated with blood donations, which implies a need for further targeting medical students.

When considering amount of blood to be drawn, we found 35.8% of students in Songea knew the safe amount of blood volume to be donated. This was somewhat similar to what is reported from Kilimanjaro, North-West Tanzania (36.5%) (12). However, these levels are not satisfactory and pose a need for more hematological guidance to medical students. Similar results were reported in Khartoum, Sudan (31%) (24), Among medical students in Gondar, North-West Ethiopia, 44.7% had sufficient knowledge for the same aspect (23).

The attitude of the medical students towards blood donation was fairly impressive (90.3%) and consistent with findings in Kilimanjaro Tanzania (93.0%) (12). This can be explained by the fact that medical students are good witnesses for the needs of blood in their practices in hospital in saving the life of needy patients.

Voluntarily donated blood was still mentioned by 77% of medical students from southern Tanzania as the best source of blood although the proportion was slightly lower compared to reports from Rajkot University, India of 80% (25) and Gondar University, Ethiopia (91.8%) (23). Additionally, 71% medical students in Southern Tanzania presented worries that after a moment of blood donation there could be some circulatory system side effects. This observation has been reported by Hinrichs and colleagues in 2017 (26). The worried in southern Tanzania were unexpectedly higher compared to what was reported in India (33.3%) (27) and Ethiopia (14.5%) (23). Those who ever donated reported experiences of temporary weakness, dizziness as similarly narrated by medical students from Northern Tanzania (12).

Some medical student (45.5%) had an experience of blood donation in primary or secondary school trainings in Tanzania which was higher than experience reported in Sudan (24), Ethiopia (23)(22),(28), Kilimanjaro (12), Pakistan (29), Northern India (30),(31) and Southern India (32). However, such proportion was lower than that reported among medical students at Nnamdi Azikiwe University 78.2% (33). The findings in this study suggest the need for more training about blood donation in schools in southern Tanzania prior to University admission. Such trainings can increase chances for volunteering for blood donation as previously reported in studies done in Solan, Northern India (31) and Northern Tanzania (12) in which prior awareness before university education was found to be a significant contributing factor.

Generally, regular blood donors had similar impact on higher blood availability in teaching hospitals when comparing non-teaching hospitals of both northern Tanzania (57.5%) (12) and southern Tanzania (55%). Tanzania is in good position when compared to Solan, Northern India (43.4%) (31). In this case we learned that regular blood donation needs be perpetuated in Tanzania to save lives in hospitals of Tanzania. Such endeavors can be guided by strong blood donation systems guided by determinants of blood donations is needed (34).

Willingness to participate in next blood donation events or whenever invited was impressive (75.6%) among the medical students of Southern Tanzania. This was higher than that of Khartum Sudan 53.8% (24) but lower than that among students at Gondar University in Ethiopia

(85.5%) (28) and Northern Tanzania (96%) (12). This observation calls for more guided interventions in the 11 medical schools of Tanzania.

Respondents feeling medically unfit (34.9%) for donation was not a common contributor as similarly described in southern India (47.8%) (32). There was a shocking paradox as students aged 20-29 years were less likely to donate blood than those at 30 years and above. This was in contrast, from the literature of Ethiopia by Mulugeta who showed age of 25 -30 years has four times significant willingness to donate blood compared to those at aged 20-24 years at 99% confident interval (23).

In southern Tanzania, male medical students were more willing to donate blood than females, a finding that is consistent with reports from Karachi, Pakistan. However, we found 4 times male willingness to donate blood in southern Tanzania compared to 1.5 times male willingness in Karachi, Pakistan (29). Surprisingly, Northern Tanzania literature showed males to have 48% lower odds of donating blood than girls at 95% confidence level (12). Other literatures elsewhere has shown that male sex has a higher volunteering attitude (16) which means targeting male medical students can be more promising.

It is therefore anticipated that NBTS and Ministry responsible for Health in Tanzania can use these findings to promote donations from medical students. With a total of 11 medical university colleges in Tanzania training about 13,000 medical students a year (35) are available for saving lives each year. Tanzania can easily reach the WHO goal of 100% voluntary non-remunerated blood donation by scaling up medical students' awareness. In this perspective we also urge other African countries with high rates of maternal mortalities, blood disorders or high proportion of accidents to scale up blood donation through the use of medical students.

Conclusion

Medical students present an opportunity for increasing blood availability in hospitals based on their good awareness, knowledge and attitudes towards critical aspects of blood donation practice. The study demonstrated their willingness to donate blood, which was significantly associated with age and gender. This group is a suitable potential source for recruiting non-remunerated blood donors for saving more lives in line with the WHO goals for blood safety and availability.

Recommendations

The NBTS and Ministry responsible for health are urged to organize University Medical College events that will collect blood from medical students. To meet the WHO goal of 100% voluntary non-remunerated blood donation, other African countries have to scale up involvement of medical students for blood donation.

Study Limitations

This study was not funded to facilitate more effective methods to engage student's participation but rather was motivated by Medical Students Association. Data were therefore collected in a short duration leading to limitation in recruiting additional medical schools in order to increase the sample size.

Ethics

Ethics approval and consent to participate Ethical clearance was granted by the Archbishop James University College - Ethical Review Committee as established by National Health Research Ethics Sub-Committee (NatHREC) of Tanzanian National Institute for Medical Research. Written consents were obtained from all study subjects with ethical review committee approval due to the fact that the data collected were not invasive with minimal health impact; hence, ascertained that the participation was voluntarily. The study participants' code numbers were used rather than personal identifiers. Finally, all questionnaires were kept for an intended purpose only.

Consent for publication

All participants have consented for publication of the result of this study (medical information, case description if needed and demographic summary without sharing names).

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

MMS: Developed the concept note and design, acquisition of data, analysis, and interpretation of data as well as initial development of the manuscript. KBZ: Made substantial contributions to design, acquisition of data, analysis, and interpretation of data. BM: made substantial contributions to the analysis, interpretation of data and initial draft the manuscript and led the

final write up of the manuscript. All the authors have been involved in drafting the manuscript and revising it critically for important intellectual content, and; have given final approval of the version to be published.

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Availability of data and materials

All relevant data are included in the manuscript. Data collection tool attached as a supplementary material. Availability of additional data and materials Data sets are available by a friendly request to the corresponding author.

Abbreviations

AJUCO	Archbishop James University College
MOHCDGEC	Ministry of Health Community Development Gender Elderly and Children
NBTS	National Blood Transfusion Services
SPSS	Statistical Package for Social Sciences
UDSM-MCHAS	University of Dar es Salaam-Mbeya College of Health and Allied Sciences
VNRBD	Voluntary Non-Remunerated Blood Donor
WHO	World Health Organization

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