Selection of right medical students to combat rural shortage of doctors: could it be a solution? In perspective of Bangladesh [version 1]

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Abstract
This article was migrated. The article was marked as recommended.

This comparative cross-sectional study was conducted to find the association between duration of service in rural health facilities and physicians' background factors to redress geographic imbalances in physician distribution. Among 6898 participants, information of 989 were retrieved from Directorate General of Health Services (DGHS), Ministry of Health and Family Welfare (MOHFW), Bangladesh, through systematic sampling. Physicians who worked in rural health facilities for less than 3 years were labelled as group A, and those worked 3 years or more in rural places were put in group B. Background factors of two groups were compared and proportion of doctors living and working in rural areas was sorted. Among the participants, eighty percent were working in urban facilities and 50% worked in rural areas for less than three years. Proportion of females was about 30% and there was no significant differences between male and female in terms of duration of stay in rural areas in both groups (p=0.07). The association between place of completion of secondary school certificate (SSC) examination and duration of services in the rural areas were found statistically significant (p=0.003). Apart from this, no other background factors were found to be significantly associated.

Keywords
Rural retention, physicians shortage, selection process, physicians background
Introduction
Geographically skewed distribution of health personnel, with a higher proportion of physicians in urban and wealthier areas (Rabinowitz, 2001; Dussault and Franceschini, 2006) is a worldwide, longstanding, and serious problem (Wilkinson et al., 2009) in health sectors. Fewer doctors work in areas with a large population, compared to a large number of doctors clustered in areas of less population, as described by Hart’s ‘Inverse Care Law’ (Wright and Jablonowski, 1987). This inequity is particularly severe in developing countries such as Bangladesh, where about 70% of the population live in rural areas (Darkwa et al., 2015), in contrast, less than 20% of the doctors practice in those places (Rawal et al., 2015). Likewise, it was reported that only 11 doctors per 100,000 population in rural areas, compared to 182 per 100,000 in urban areas in the country (Ahmed et al., 2013). This is one of the greatest challenges in achieving ‘access to quality essential health care services for all’, a key component of Sustainable Development Goals (SDGs). Therefore, it is crucial to ensure equal distribution of health work forces including graduate doctors in rural areas (WHO, 2018).

Researchers found rural exposure to education, recreation, and upbringing facilitates rural practice of doctors in the future (Dixit, 2002; Lindelow and Serneels, 2005; Besley and Ghatak, 2005). However other authors commented this association as inconclusive (Hancock et al., 2009). To overcome the problem of rural shortage of health work forces, World Health Organization issued evidence-based guidelines on rural retention in 4 major domains: education, regulatory, financial incentives, and professional-personal support (WHO, 2010). Many more economically developed countries (MEDC) reviewed different factors and programs to improve this imbalance and found rural background of medical students as a positive factor to choose rural areas as future working places (Brooks et al., 2002; Ross, MacGregor and Campbell, 2015). However, rural areas of MEDC are different from that of less economically developed countries (LEDG). Hence, to solve this long-standing problem in Bangladesh, it is important to find out whether there is any association of doctors’ background factors and preference of working in rural areas. This comparative cross-sectional study was conducted with the aim to find the association between government doctors’ background and duration of work in rural facilities. Findings would explore information regarding doctors who are more likely to work in rural areas which may guide the selection process of medical students in the future.

Methods
The study was carried out from July 2018 to June 2019 by retrieving information of doctors from Management Information Systems (MIS) of Directorate General Health Service (DGHS) (See Supplementary File 1), Bangladesh. Information of 6898 doctors who had been working in the government sector up to 2015 were entered in the sampling frame. Among them 1300 subjects were selected randomly by systematic sampling with an interval of 6 from the sampling frame. After exclusion of missing data, finally 989 doctors records met the inclusion criteria. Missing data of the study was 23.9% of the sample.

In terms of location, primary health care centers named Union Sub-Centre and Upazila Health Complex (UHC) were taken as rural areas, whereas secondary and tertiary health facilities including district and divisional hospitals were considered as urban facilities. In this study, doctors who worked less than 3 years in rural health facilities were taken as group A, and those who worked in rural areas 3 years or more were included in group B for comparison. The information of doctors included age, gender, places of grade 10 school board examination (Secondary School Certificate, SSC), grade 12 higher secondary school certificate (HSC) examination (See Supplementary File 1), duration of service in rural and urban facilities, current working place and living area. The required data were retrieved from the doctors’ record of MIS of DGHS and plotted in a spreadsheet. In case of any missing data, the respective doctors were contacted over telephone, and disagreement to provide information resulted in exclusion from the study.

Quantitative data were analyzed by SPSS 20 using p < 0.05 as level of significance differences between variables. Chi-square analysis was done for categorical variables. The odds ratio (OR) was determined to find the association between background factors of the doctors and duration of stay in rural health facilities.

Results/Analysis
Among 989 doctors, 71% were male; 72% had their Secondary School Certificate (SSC) in urban areas, and 97% completed Higher Secondary School Certificate (HSC) in urban areas. Sixty two percent of the participants completed their post graduation. In the study, only 8% of the doctors lived in rural areas and about one fifth (19.7%) were working in rural facilities of the country Table 1.

Figure 1 illustrates the place of education and living areas according to the administrative units of Bangladesh (See Supplementary File 1). Two hundred and twenty-nine (23%) doctors completed their SSC from rural areas, whereas 77% did it from urban areas with major portion in district school (39%). In regard to HSC, only 32 (3%) doctors completed from rural schools with great majority (97%) from the urban areas, divisional schools being the largest contribution
Regarding living areas, only 79 (8%) doctors were in rural areas whereas about 451 (46%) stayed in the capital city of the country. Among participants, 892 (90%) completed their 5 years in government service, 461 (50.27%) of them worked in the rural areas for less than 3 year. Thirteen (1.42%) doctors never served in rural areas. One hundred fifty-three (15.47%) of them were posted in rural areas for 7 years or more (Figure 2).

Table 1: Distribution of the characteristics of government doctors included in the study

| Characteristics         | Frequency | Percent |
|-------------------------|-----------|---------|
| Gender                  |           |         |
| Male                    | 702       | 70.97   |
| Female                  | 287       | 29.3    |
| Current Address         |           |         |
| Rural                   | 79        | 8       |
| Urban                   | 910       | 92      |
| Post-graduation         |           |         |
| Yes                     | 615       | 62.4    |
| No                      | 370       | 37.6    |
| Place of SSC            |           |         |
| Rural                   | 229       | 23      |
| Urban                   | 760       | 77      |
| Place of HSC            |           |         |
| Rural                   | 32        | 3.2     |
| Urban                   | 957       | 96.8    |
| Current work place      |           |         |
| Rural                   | 183       | 19.7    |
| Urban                   | 732       | 78.7    |
| Other                   | 15        | 1.6     |

Figure 1. Place of education and living areas according to the administrative units of Bangladesh

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The association of duration of service in rural areas to gender and place of education were compared (Table 2). Group A consisted approximately 47% of the study participants and group B contained 44%. In group A, about 69% were male, while in group B, 73% were male. No significant association was found between gender and duration of work in rural set up (p=0.07). In group A, 79.82% had SSC exam from urban institutes, compared to 70% in group B. The association between place of SSC and work duration in rural areas were statistically significant (p=0.003) in two groups. In both the groups, very high proportion of doctors (98.26% and 94.43%) had their HSC done from urban schools. No significant association was found between the place of HSC and duration of work in rural areas (p=0.08).

Discussion
This study clearly indicates that most doctors in the study population grew up (approx. 80%), living (90%) and working (80%) in urban areas. With these urban dominant health care providers, it is questionable how they can be retained in rural areas.

The government of Bangladesh has taken initiatives to address the issues of rural shortage of doctors and to improve the health care facilities to the rural communities. Among them, few steps are as follows:

Primary Health Care (PHC) infrastructure: In Bangladesh, Upazila [sub-district] Health Complex (UHCs) and Union Subcenter are considered as Primary Health Care (PHC) facilities and were designed to provide a wide range of healthcare functions. Despite well designed PHC infrastructure in the public sector, physician shortage in underserved areas is a decade long problem in Bangladesh and only 25% of government doctors are working in rural facilities (Ahmed et al., 2011). In this study, the findings are similar, about 20% of the study population had worked in PHC.

Compulsory rural service of medical doctors: Since the 1980s, the compulsory service of doctors in rural health care facilities has been implemented by the Government. According to the revised gazette of Transfer and Posting Policy for
Officers in Health Service (Joarder et al., 2018), the newly appointed doctors must serve at least two years in rural areas. However, despite having this rule in place, half of the study participants (50%) served in rural health facilities less than 3 years. It means presumably the existing policy is not helping to improve the situation.

Encouraging rural doctors to post-graduation: Government doctors who worked in remote areas for at least one year, get a chance to enroll in a post-graduation course, whereas without working in a remote area the time limit is at least 2 years (BSMMU, 2021).

Reserved district quota for medical admission: For the country’s medical admission, 20% quota are reserved for district students which are selected by parents’ district of origin, rather than where they were raised. This policy was adopted long ago when communication to and living standards in district levels were less developed than present time. Therefore, this policy may not be conducive to the students who live in rural areas in the present context.

Many countries, including developed and developing, tried different programs to encourage students with rural background for medical education to solve the problem and found positive association with rural retention of physicians in the future (Budhathoki, Zwanikken and Pokharel, 2017; Verma et al., 2016.). This study results also found that doctors who spent their school life in rural areas had worked longer in primary health facilities. This association was statistically significant (p = 0.03). Considering this study findings, authorities of medical education could think about changing the entry criteria of medical students to encourage more rural students in the selection process. However, questions may come about how students with a rural background will be selected. Bangladesh is a plain land with some hilly areas where all upazila (sub-district) and villages are not similar in terms of infrastructure and facilities. For example, understandably suburban places adjacent to metropolitan cities are more developed than similar suburbs of smaller towns. Therefore, it is important to find a way to select the genuine students who were raised in the districts to avail the facility of reserve seats for those areas. In these circumstances, the place of SSC can be considered as the place of raising.

Another important finding of the study was fewer number of female doctors working in government sector (30%) but no significant association between duration of work in rural health facilities and gender (p=0.07). This indicates female gender is probably not a negative factor for rural staying. Lack of or less interest to work by female doctors in the government sector is not a new problem; in 2007, there was a gross imbalance in gender ratio, favoring males in the service, four males to one female (Ahmed et al., 2011). Therefore, the policymakers need to consider the female students with rural backgrounds who, in the future, are more likely to stay in rural places.

This study revealed that more than half of the study participants (62.4%) did their post graduation, hence intended specialist career rather than general practitioner. In Bangladesh, 2-3 years post graduate training is a mandatory requirement, before taking the exit post graduate examination. Therefore, medical education can implement mandatory rural training, at least for some duration, as a requirement for postgraduate training. This might rectify to some extent in alleviating the problem. At the same time, this will help them to be familiar with the community and its related health problems. However, study with underserved areas postgraduate training found mixed outcomes. Comparative study in USA observed rural training reduced rural shortage whereas an Australian study without having comparison, found a small percentage (14%) of individuals reported that they were influenced against rural practice after their placements (Verma et al., 2016). Therefore, the effect of rural post-graduate training needs further evaluation.

Overall, the study revealed that despite several steps taken by the Government of Bangladesh, there is ongoing severe shortage of physicians in rural and remote health facilities. The problem will not resolve unless evidence-based steps are taken for the change of attitude and motivation of doctors. In fact, success or failure in attracting physicians to rural facilities or retaining them in rural posts vastly depends on their choice of working places, not only on the policy.

In Bangladesh, most of the previous studies regarding this subject were conducted by taking interviews of medical students to find their future preferences of workplaces and analysis of ongoing government policies to improve the condition. As future workplace choices are ever evolving and complex, those studies could assume rather than find the association of rural staying of doctors and related factors. This study was conducted by taking information from doctors on the job. It reflected the realistic scenario of physicians’ choice and the situation of the health system in Bangladesh. Therefore, the findings of the study might be helpful in assessing the association between rural stay and background factors of physicians.

This study had limitations as missing data was nearly 24% due to retrospective collection of information which might have affected some of the findings. The study worked on only two background factors of participants. As many other complex matters are involved in rural retention of doctors, prospective studies with large samples should be conducted to
explore the impact of other factors like, curriculum, spouse motivation, facilities, monitoring, logistic and infrastructural support etc. Moreover, the study included only government doctors which may not be reflective of the total scenario of the country though the private health sector of Bangladesh too is predominantly urban based (Dussault and Franceschini, 2006).

**Conclusion**
In summary, the study revealed that the health care system of Bangladesh is dominantly urban based whereas most of its population live in rural areas. The proportion of doctors working in rural facilities were substantially less. Number of female doctors in the government sector is low as well. However, there was no statistically significant association in gender and duration of stay in rural facilities. In contrast, upbringing in rural places was significantly related to duration of service in rural health facilities. Most of the doctors preferred specialization rather than working as general practitioners. It can be concluded that, Bangladesh should come out from the urban based health care system to ensure health services to its majority of population. Encouraging more students from rural areas, implementing post-graduate training facility in underserved areas, ensuring suitable environment and policy for retaining more female doctors in rural places, are the possible additions to be considered in the health policy. Addressing the rural shortage followed by monitoring of sustainability to achieve the desired outcome in this regard would be the key in overall improvement of the condition.

**Take Home Messages**
- Medical course selection criteria need to be modified to encourage more rural students.
- Place of secondary school should be considered as place of origin to meet district quota.
- Female gender is not a negative factor for rural retention.
- Training in rural facilities should be included in post graduate training.
- More prospective studies are required to solve this complex problem.

**Notes On Contributors**

Laxmi Saha, a specialist Obstetricians and Gynaecologist is also a Master in Medical Education. Among her publications the most remarkable one titled, ‘Use of in vitro Fertilisation Prediction Model in an Asian Population-Experience in Singapore’ which was awarded as the best merit award of Annals of Medicine, Singapore 2015.

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**Declarations**
The author has declared that there are no conflicts of interest.

**Ethics Statement**
Ethical approval for this study was obtained from Ethics committee at Centre for Medical Education (CME) on 13/10/2014, approval number: CME/MMed/A-S 13-14/2013/308 Centre for Medical Education, Mohakhali, Dhaka, Bangladesh.

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Figure 1 and 2. Source: the authors. No figure was copied from any other sources.

Bibliography/References

Ahmed, S. M., Hossain, M. A., Raja Chowdhury, A. M. and Bhuiya, A. U. (2011) The health workforce crisis in Bangladesh: shortage, inappropriate skill-mix and inequitable distribution. *Health: Human Resource.* 9(3).

Ahmed, S. M., Evans, T. G., Standing, H. and Mahmud, S. (2013) Harnessing pluralism for better health in Bangladesh. *Lancet.* 382(9890), pp. 1746–1755.

Besley, T. and Ghtatak, M. (2005) Competition and incentives with motivated agents. *Am Econ Rev.* 95, pp. 616–636.

Brooks, R. G., Walsh, M., Mardon, R. E., Lewis, M., et al. (2005) ‘What works’ in influencing medical students’ motivation to practise in rural areas in low-income and middle-income countries: a systematic review. *BMJ Open.* 7, pp. e013501.

Budhathoki, S. S., Zwanikken, P. A. C. and Pokharel, P. K. (2017) Factors influencing medical students’ motivation to practise in rural areas in low-income and middle-income countries: a systematic review. *BMJ Open.* 7, pp. e013501.

Bangabandhu Sheikh Mujib Medical University. (2021) BSMMU Notice for Admission in Post graduate courses. Available at: Reference Source

Darksa, E. K., Newman, M. S., Kawkab, M. and Chowdhury, M. E. (2015) A qualitative study of factors influencing retention of doctors and nurses at rural healthcare facilities in Bangladesh. *BMC Health Serv Res.* pp. 15–344.

Dixit, A. (2002) Incentives and organizations in the public sector: an interpretative review. *J Hum Resour.* 37(4), pp. 696–727.

Dussault, G. and Franceschini, M. C. (2006) Not enough there, too many here: understanding geographical imbalances in the distribution of the health workforce. *Human resources for health.* pp. 4–12.

Hancock, C., Steinbach, A., Nesbitt, T. S., Adler, S. R., et al. (2009) Why doctors choose small towns: A developmental model of rural physician recruitment and retention. *Social Science & Medicine.* 69 (9), pp. 1368-1376.

Joarter, T., Rawal, L. B., Ahmed, S. M., Uddin, A., et al. (2018) Retaining Doctors in Rural Bangladesh: A Policy Analysis. *Int J Health Policy Manag.* 7(9), pp. 847-858.

Lindelow, M. and Serneels, P. (2006) The performance of health workers in Ethiopia: results from qualitative research. *Soc Sci Med.* 62, pp. 2225–2235.

Rabinowitz, H. K., Diamond, J. J., Markham, F. W. and Santana, A. J. (2013) Retention of Rural Family Physicians After 20-25 Years: Outcomes of a Comprehensive Medical School Rural Program. *The Journal of the American Board of Family Medicine.* 26 (1), pp. 24–27.

Rawal, L. B., Joarter, T., Islam, S. M. S., Uddin, A., et al. (2015) Developing effective policy strategies to retain health workers in rural Bangladesh: a policy analysis. *Human Resources for Health.* pp. 13–36.

Ross, A., MacGregor, G. and Campbell, L. (2015) Review of the Umthombo Youth Development Foundation scholarship scheme 1999-2013. *Afr J Prim Health Care Fam Med.* 7, pp. 1-6.

Verma, P., Ford, J. A., Stuart, A., Howe, A., et al. (2016) A systematic review of strategies to recruit and retain primary care doctors. *BMC Health Serv Res.* pp.16–126.

Wilkinson, D. W., Beilby, J. B., Thompson, D. J., Laven, G. A., et al. (2000) Associations between rural background and where South Australian general practitioners work. *Medical Journal of Australia.* 173, pp.137–140.

Wright, J. S. and Jablonowski, A. R. (1987) The rural-urban distribution of health professionals in Georgia. *Journal of Rural Health.* 3(1), pp. 53–78.

World Health Organization. (2010) WHO Global policy recommendations - improving access to health workers in remote and rural areas through improved retention. p. 17. Available at: Reference Source

World Health Organization. (2018) WHO The 2018 update, Global Health Workforce Statistics. Geneva. Available at: Reference Source (Accessed: 13 February 2021).
Richard Hays  
James Cook University

This review has been migrated. The reviewer awarded 4 stars out of 5

I agree that the influence of possible predictors of rural practice location is an important research topic outside of the developed nations, where more is known. My experience has taught me that the meaning of 'rural' differs widely between nations. There are many measures within local definitions, but all include population data and proxies for access to services, particularly in education and health care. In Australia, Canada and the USA there is strong overlap with being 'remote' in a geographic sense, elsewhere large rivers and mountain ranges are more important. What we have in common is that there is a consistent urbanisation with major lifestyle changes that seem to make working in larger centres more attractive. There is also an international trend away from primary care careers and relatively few narrower specialty positions outside of urban centres, making workforce research very complex. In this study, we see that rurality (defined by address at graduation from secondary school) is a predictor of future practice. This supports policies that actively recruit rural background students into health professional courses. It would be worth increasing intake of rural background students and following up to see if this improves the workforce distribution, although the impact is likely to be stronger with additional rural curriculum, assessment, clinical placement experience and role modelling, as found in Australian research. The main weakness of this paper is the low response rate, but it is still worth reading for rural educators both in Bangladesh and elsewhere, as it strengthens the international evidence base.

*Competing Interests:* No conflicts of interest were disclosed.
Jennifer Cleland  
University of Aberdeen

This review has been migrated. The reviewer awarded 4 stars out of 5

It is really important to have papers reporting on workforce issues from less developed countries and I applaud the authors in their efforts to bring some understanding of the issues in Bangladesh to a wide audience. They are correct in saying that the patterns seen on more developed countries may not be the same as those in less developed ones. However, given the findings, it would have been nice to have included comparison with previous literature, particularly from Puddey and Playford in Australia, as well as studies from Canada/NOSM. How this issue is addressed does indeed need changes in policy and selection criteria and practices. Remote and rural exposure, role models from remote and rural areas as teachers and other curricular strategies also need to be considered.

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