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## ABSTRACT

*Recognizing the complexity of the economic and social determinants of health, it is necessary to provide a resource of health knowledge and information on healthcare for individuals. In Bangladesh, population growth and the associated pressures of development are increasing the difficulties associated with sustaining effective public health practices and policies. The interrelationships among science, technology, society, politics, environment, and all of the specific contexts of human health and welfare are a complex web. It is not possible to extract any one area without having to examine the connections to others. However, the unifying factor can be a good quality education on the health issues of the country. It is, therefore, necessary to integrate world health issues into a life science classroom.*

*Due to some positive actions undertaken during the past few years, gender gap has been considerably reduced from the primary and secondary education. The net enrollment rate of girls is higher than that of boys at the primary level, yet there are still some social practices (i.e. behavioral treatment) that favour boys over girls in Bangladeshi institutes. However, this gap widens at the tertiary level education system due to inadequate budgetary provisions. This is so because the study of science is becoming more and more expensive, and the axe falls on females. The women of developing countries like Bangladesh, lucky enough to have pursued science education, will find discrimination at the work place.*

## 1. INTRODUCTION

Owing to the complex inter-relationship between economic and social determinants of health, it is necessary to provide a resource of health knowledge and information about healthcare for individuals. In Bangladesh, population growth and the related pressures of development are increasing the difficulties associated with sustaining effective public health practices and policies. The connections among science, technology, society, politics, the environment, and all of the specific contexts of human health and welfare are a complex web. It is not possible to extract

any one area without examining its connections to others. However, the unifying factor can be a good quality education on the health issues of the country. It is therefore necessary to integrate world health issues into a life science classroom.

## 2. WOMEN AND SCIENCE IN BANGLADESH

Gender is about men and women and not males and females. It is not synonymous with sex. Sex refers only to the biological and physiological process. Men and women are not equal; nor will they ever be in terms of sex. Gender, however, does not only refer to the biological differences, but also to the social and cultural structure in a given society and its cultural setting. Gender is a multi-dimensional concept of social knowledge that helps to regulate socially defined sexually differentiated roles and relationships, particularly power relations between women and men, said Jayawickramarajah, in 2001 at Regional Health Forum, WHO South-East Asia Region.

In Bangladesh, many talented and committed women are bypassed where it comes to science education and career because of their gender. However, progress of 21<sup>st</sup> century will be appraised and reviewed on the basis of human development, that also includes the development of women in the developing countries. In Bangladesh, almost 49 % of the total population are women, of whom nearly 86 % live in rural areas. The adult literacy rates are 59 % for men and 48 % for women. But in the rural population, only 30 % men and 16 % women are literate. However, it is gratifying to note that the female literacy rate among young Bangladeshis is actually higher than the literacy rate for males.

## 3. HEALTH IN SCIENCE EDUCATION

An educated and healthy population is essential for sustainable economic development and eradication of poverty. Although men and women have a basic right to health, education and well-being, the global information shows some serious violation and inequalities in health status and access to healthcare and education services. Global consensus supports gender equality in health and education as a policy objective. It is considered to be the most important

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measures for bringing the women in the mainstream.

The WHO Gender Policy integrating gender perspectives in the work of WHO was announced in the year 2002 to contribute to better health for women and men through health research, policies and programmes which give due attention to gender considerations and promote equity and equality between men and women .

The development challenges of Bangladesh with include poor quality health and education services, unequal access to those services not just for the poor only but female population. For many involved in such processes, fulfilling a child s right to education ends in the provision of school buildings, teachers and learning materials that equip the child to read and write. The fact that a congenial learning environment goes beyond mere provision of these, is often overlooked. The importance of educating girls about health and hygiene during primary education, and providing such facilities in schools is crucial, as many of them become mothers at very young ages.

There are many schools in the country with deplorable sanitary conditions, and, in most cases, with absolutely no considerations for the special needs of girls. Thus, in most schools one will find a serious lack of adequate water supply and functional sanitation facilities. Girls have also reported the absence of privacy, which causes them embarrassment and fear of using the toilets. Under such circumstances, many girls shy away from attending classes for certain days of the month. Poor sanitary conditions also cause frequent illnesses and under nourishment. Irregular attendance of school negatively impacts their academic performance. All the absentees in a particular year add up to a substantial sum. Such a scenario leads to fewer enrollments by girls into science subjects, which not only require longer hours because of the practical classes but regular attendance as well. Ensuring gender equality for girls and boys means that they have equal opportunities in school (Qumrun and Rokaya, 2006).

Although the Government is promoting higher education for girls by providing special incentives and stipends, and is often allocating funds to pay the salaries of teachers; construct new classrooms; and purchase textbooks. There is enough evidence to suggest that these attempts will bear little fruit unless accompanied by improvements in the water and sanitary conditions. However, helping girls to

successfully complete primary education and move on to secondary education requires more than just water and sanitation at schools, these two are critical inputs into better schools. At a school hundred of children can be reached out each day at one place in order to provide them better healthcare. Healthier students learn better; become productive members of society; and can share the importance of basic public health measures in their own homes and communities.

Health programme in its broadest sense is a multi-sectoral intervention, focusing on the physical, social, economic, and spiritual dimensions that can bring total health to individuals, their families and communities. There is, therefore, a paradigm shift from curative action to health promotion and the prevention of ill-health. Since government is the key player when it comes to creating provisions for facilities, it has a significant role in ensuring that the special needs of adolescent girls become an integral part of any intervention to ensure higher attendance of girls at school.

Programmes for advancing women s health must also involve policy makers and civil society, ensuring that government policies are in effect that benefit women s health and increase their access to vital health services and products.

Government-funded initiatives are required to: i) reduce pressure on women to sacrifice their own health in order to care for children, elderly, and the infirm; ii) promote gender equality in unpaid family care work; iii) formulate industrial relations policies that are family friendly for both men and women. One needs to prioritize the pursuit of safe public spaces and transport systems in order to increase the mobility and access to services of individuals of both genders.

In addition to relevant government policies, from commitment by practitioners and implementors is also needed to reduce institutional biases. Because of such biases women and men are not on a level playing ground in terms of their access to health services as consumers, as producers or even as decision-makers. There is a need to recognize that gender bias in health sector institutions damages the effectiveness and sustainability of any health programme.

## 4. GENDER IN SCIENCE EDUCATION

Many of the science curricula, examination systems and teaching methods in Bangladesh and other

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<sup>1</sup> Women and men in this document, refers to women and men of all ages.

developing countries have been borrowed from western countries and have failed miserably to address their current challenges. This has resulted in a science education that is characterized by irrelevant, de-contextualized knowledge being transferred by poorly trained teachers in overcrowded and under-resourced educational institutions.

However, there is no denying that one of the clearest signs of a society's intellectual health is the strength of science and mathematics education. Science and mathematics facilitate developments in scientific research and industrial technology, and ultimately lead to a more diverse, robust economy. Science, mathematics and technology education constitute the areas within the educational system where the gender disparity, in several of the poorest countries of the world, is greatest. Unfortunately, these are also the areas of the educational system where many of the skills resulting from such an education, stimulate development. Securing good health, fighting diseases, protecting the environment, farming and developing agriculture, and developing new industries and technologies, are all activities that require skills in science and technology. A proper science education is also considered crucial to empower pupils and equip them with skills necessary to play a constructive role in the future. Science education in several developing countries however has been found ill-suited to equip pupils with such skills.

## **5. GENERAL PERCEPTION: SCIENCE EDUCATION IS FOR MEN**

There is a general perception that science education is for men, which gives science a masculine image and does not accommodate female participation. Despite the documented evidence of the benefits of female education, for economic and social development, relatively fewer girls are given opportunities to acquire science education in many of the developing countries of the world. Approaches have been taken for female-friendly, gender-neutral and gender-sensitive science education. However, these labels are widely used without a clear explication on what constitutes these concepts and what action is required to be taken in order to achieve their goal. In Bangladesh, besides the public sector institutions, non-governmental organizations, are involved in such efforts. But one will hardly find any thrust towards seriously redressing gender inequity in science education. In spite of the increased focus on female education, few seem to realize that much of what is expected as outcomes of education for all, actually presupposes a high-quality

science education for all.

There is a tendency, starting right from preschool level, for educators to choose classroom activities that appeal to boys' interests and to select teaching strategies in which boys excel (Ho, Tomlinson and Whipple, 2011). Hence, girls are usually less enthusiastic towards science education; this is not because they think that they are not competent enough to pursue a career in science. Girls say that teachers encouragement is a big factor in their pursuit of advanced mathematics and science courses. This perception of science as masculine subject is still persistent in many developed countries; however, the message is not communicated as clearly to pupils here in Bangladesh as is in the developed countries. Girls in the country are often told by their parents, teachers and peers that science is not suitable for them. Choosing to pursue a career in science in many of these countries is, therefore, regarded as masculine. Females who choose this career path are often looked upon as less feminine and, thus, regarded as less attractive on the marriage scale. It is this mindset of the parents/guardians and also the teachers that needs to be changed. The under representation of female science teachers, and hence lack of female role models, particularly in secondary schools have also been shown to have a negative impact on girls. It is therefore desirable that education policy should focus on ways to encourage girls to be interested in science education and break the stigma attached to science education of girls.

Research has also generally supported the conclusion that there are no biological, neurological, or genetic factors at work in the creation of scientific gender disparity. However, since gender differences in performance and participation in science education is still persistent in many countries; this can, therefore, indicate that the problem of poor performance and participation among girls in science education is more of a pedagogical and cultural in nature than a problem caused by gender differences to learn science. A combination of elements come together to make it difficult for girls to train for and maintain a career in science. These factors, as indicated earlier, include social stigma of the sciences as masculine and also the institutional biases in the scientific community.

Due to some positive measures included in National Education Policy of Bangladesh, and its implementation in the past few years, gender gap has apparently been reduced at the primary and secondary education levels. The net enrolment of girls

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is higher than that of boys at the primary level, but there are still some social practices (i.e. behavioral treatment) that favor boys over girls in the country's educational institutions. Moreover, basic infrastructural facilities in educational institutions for girls (i.e. girls toilets, science labs) are not sufficient either, due to which girls withdraw from science education.

While girls generally express positive attitudes towards science at primary education levels, they tend to lose interests in science and develop negative attitudes towards the subject as they move to secondary school. This gap further widens at the tertiary level education, where not many financial commitments have been made to remove the biases. The problem is accentuated because the study of science is becoming more and more expensive, and the axe falls on females. Parents would rather allow and often coax their sons, even those not interested in science, to study science than allow a yearning daughter to do the same. Since their daughters leave after marriage, their education is also tailored to the opportunity of finding suitable husbands rather than what they may want to do. For those lucky enough to have pursued a path in science, will find discrimination at the work places. Therefore, in countries with high unemployment rates, this makes it even less attractive for parents to pay for an expensive science education for the girls.

It is thought that science disparity has its most profound effects on students at the university level, but addressing the issue requires a mix of approaches at every stage of education. Younger students must be exposed to the subjects of mathematics and science in a way that makes it clear that they can, and should, do their utmost to attain excellence. In high school, a greater range of science subjects, along with a broad range of associated requirements for all students and higher availability of after-school tutoring, will help to eliminate the stigma of mathematics and science as being too difficult, irrelevant or masculine for that matter. At the college level, a well-designed curriculum with emphasis on the scientific components of a general education will help students of all backgrounds to explore their interests in the scientific world while deciding on their future careers.

After having acquired a degree in science, most Bangladeshi women would either become teachers or follow some other career. Hardly any woman would contemplate a career as a researcher in science. In general, this is true for many developing countries.

The world as a whole is failing to take advantage of an available resource: the brainpower of women scientists. It is no longer a question of convincing people that women can do well in science, it is a question of whether work environments are made conducive for female scientists, who traditionally face gender discrimination and often have a harder time balancing work and family.

The competitive nature of funding research endeavours drives the typical 50 to 60 hour work week of most scientists and poses a daunting challenge for many women. Their careers are a constant gamble, as it is hard to strike the right balance between three things:

- i) how much they must commit to their career in order to remain a competitive scientist;
- ii) how much time they should devote to their households and to meet the traditional social demands; and
- iii) how much time and effort to give to their children to help in their growth and development.

These women usually have a deep passion for science, but they have to combine it with the willingness to compromise their marriage, their career, or the happiness and well-being of their children. It is easy to see why many women would choose not to confront those risks on a daily basis.

Science is passion, vision, and a way of life, but it is almost synonymous with sacrifice or compromise or even misery for many women from the developing countries. When the choices women make in life are choices they are willing to make, then these should be the choices that make them satisfied and happy. And today science requires content and balanced men and women to carry out research and development in the field. Many female scientists are making significant personal sacrifices to achieve professional goals. Female researchers are struggling to balance their personal lives and their careers in science, technology, engineering, and mathematics (STEM).

There are many strong women who would want other women to muster super-human levels of self-assurance in order to change the way they are perceived and treated. This seems less of a solution to the problems women face in the workplace and more of a coping mechanism - one that may avert male prejudice but not address its root causes. It implies that if women get emotional, say, or falter for a moment in their resolute belief that they are capable and

deserving, the consequences are their responsibility.

One will find many talented young female scientists in the country who are very worried about their careers and they have every right to be worried. They are competent women, who understand their worth and are convinced of their potential to contribute. But these are women in disciplines populated by people who may, subconsciously, believe in women's inferiority, which brings about a gender-biased system that makes it difficult for female scientists to have a career and a family and to succeed at both. Unless the government and academic institutions take action to make it easier for them to balance work and private life, women are forced to choose between the two.

Using biology as a field for the analysis, it can be pointed out that over the years, there may have been an increase in the number of women scientists in biology, but gender-based disadvantages continue to be the order of the day even in academic institutions of Bangladesh (Beede, 2011). Many science departments will not recruit women faculty beyond a certain number despite being equally or more qualified.

Most M.Sc courses and Ph.D programmes in the country's national institutions have a large proportion of women students. In biology, women even outnumber men. However, if the available data on scientists and academic faculty members, in diverse institutions is inspected, it would reveal that very few women continue to struggle up the scientific ladder. This erosion is undoubtedly a result of the difficulty in pursuing a career that demands an excessive investment of time, in the face of increasing family demands. Even though we now see families allowing their female members to work but they would be happy to see they pursue a 9 to 5 job rather than work as researchers, which requires putting in longer hours.

Research requires a quick mind that should be free from stress and calls for an environment that is supporting and encouraging. Many women are not fortunate enough to find such support and encouragement either from the society or their families. Many women lose interest in the pursuit of their profession at a very early stage. Even for those who cross this hurdle successfully, find a path crisscrossed with endless obstacles impeding them to work and excel.

Contrary to common belief, a female researcher works as hard as a man if not harder, and is intellectually as

equipped for the job as her male counterpart. Science requires one to have patience and perseverance. These attributes are found more often in females than in male scientists. Despite all, sometimes having male researchers seems like the best choice. This is especially so because most institutions, including the reputed institution, like Dhaka University, do not have a separate section to cater to the needs of researchers like having an officer to look into the import of chemicals, or getting perishable research items released quickly from the airport. Since a project will not allow recruiting people other than researchers, therefore, it is convenient to employ male research associates so that would come in handy when dealing with such matters.

Following are some of the problems in Bangladesh due to which one does not find many women in science: (i) security for working women (when working until late hours measures have to be taken to ensure that she is not alone and to have someone to escort her home after work); and (ii) discrimination in recruitment, harassment at the workplace, problems of reconciling the demands of families, with the sometimes impossible demands of a research career.

Being asked to perform maximally at jobs at a time in their lives when other needs compete for their energy and time, such as family care, can often be a big obstruction for women scientists. Some opine that if women had the flexibility to move slower at first until their family needs (at early career level when family life is also stabilizing and children are still too young) were met, they could be very productive later in their scientific careers. There is evidence showing that mid-career and older female scientists produce articles that are cited more highly than articles by their male colleagues (Jaschik, 2007). This leads to the argument that women would excel, if only they could be allowed delayed start-ups. As can be seen, there is no straightforward solution to this situation, and if delayed start-ups were permitted, it would raise a host of other serious issues having to do with gender equity, and ensuring and evaluating progress in professional fields. Studies have shown that many very talented women are far more likely to put their own careers on hold to facilitate the careers of their partners.

Many men and women alike think that it hardly matters whether the practice of science is being done by a man or a woman. But hardly ever are any steps taken either at the workplace or at home to make a woman prove her worth as a scientist. Science is science, and gender has very little to do with it. By pursuing science

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education, women like men attain intellectual growth; it provides tremendous confidence, mental maturity and happiness. It definitely helps other women stand up and gain confidence, and encourages other women to join the field.

Not only science, women have little access to information technology and are barely equipped with business education. Therefore, they lag far behind in all professions requiring IT and business knowledge.

### 6. CONCLUSIONS

Twenty first century is ushering an era of new hopes and aspirations for the women folk, as the women of Bangladesh can now look forward with pride and hope for achieving significant improvements in education. Active cooperation between men and women is a must to clear the pathway to decent work environment for women.

As for the gender issues in science education, Bangladeshi women like other women of any developing country of the world to whom science is passion, vision, and a way of life, are making significant personal sacrifices to study science in universities far away from home among many adversities in order to achieve professional growth. They are struggling to balance their personal lives and their careers in science, technology, engineering, and mathematics. They we salute!

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