

MORE WOMEN IN SCIENCE AND TECHNOLOGY A COMMITMENT TO SUSTAINABLE DEVELOPMENT GOALS IN DEVELOPING COUNTRIES: SUDAN AS A CASE STUDY

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Women in Science: historical membership at academies of science

The debate on the fact that there are very few women (less than 10%) in the leading research institutions was raised more than four decades ago. This has triggered several studies to document the contribution of women to science and scientific discoveries. In 2010, the Royal Society of London celebrated its 350th anniversary; but the historic absence of women scientists from the seminars, exhibitions and publications was noted. Although the Royal Society was founded in 1660, women were not permitted by statute to become fellows until 285 years later, in 1945. An exception was made for Queen Victoria, who was made a royal fellow. This situation was not unique for the British; it was the same for other elite science academies.

The American National Academy of Sciences was established in 1863 and women were allowed to become members in 1925. The "Académie des Sciences" in France was established in 1666 and women members were recognized as late as 1962. Interestingly, Marie Curie application for membership of the Académie was rejected in 1911, the year she won her 2nd Nobel Prize. The German Academy of Sciences Leopoldina was founded in 1652 and the first female member was allowed in 1932. The Russian National Academy was established in 1724 and a woman member joined in 1939, Professor Lina Solomonovna Shtern (1878 – 1968). She was a Jewish Russian Soviet biochemist and one of the founders of modern chemical physiology and was the one elected at the German Academy Leopoldina.

Women have always been providers of medical care, offering remedies in the home, nursing the sick or acting as herbalists. However, the medical

profession had been male dominated for most of its history. In Europe, from the 1400s, it was decided that only those trained in universities were allowed to formally practice medicine. It was until the 1900s, that women were allowed to study and practice medicine in the same way as men. In the field of nursing and midwifery, women provided many services in spite of not being allowed in the formal education. It was until 1860 that the Nightingale Nursing Training School was started. Since the 1950s, higher education and involvement of women in science, technology, engineering, and mathematics (STEM) have shown increasing numbers in many countries. Several surveys showed that women can do better than men academically, receive more awards, and have higher graduation rates and better attitudes toward education, yet few of them reach the high posts in the system. Interviews, case studies and statistics suggest two primary factors press on women to leave the STEM workforce i.e.: a- need to balance career and family, b- lack of professional networks.

a- Need to balance career and family

Many women PhDs in STEM leave workforce soon after they begin academic employment. Marriage and family generate demands on both male and female scientists. A survey (2001)¹ has shown that single men and single women participate about equally in the STEM workforce when they start off after graduation. However, a married female PhD is 13% less likely to be employed than a married male PhD, while if a woman is married with young children, she is 30 % less likely than a single man to be employed.

The grand challenge for many women is that their biological clocks influence choice of marriage and

children or maintaining a demanding career which is very competitive.

A survey of 450 female scientists and engineers employed at research universities in USA showed that > 70% cited that the most significant challenge facing their professional advancement is the need to balance career and family demands.

b- Lack of professional networks:

Several studies indicated that younger women in science lack professional advice to assist them through their career. Many institutions do not provide mentoring related to women as a special working group.

A study at the School of Science, Massachusetts Institute of Technology (MIT/USA, 1999) showed that young science women staff believe that men and women were treated equally in terms of resources, salary, and other material benefits. They were supported by their departments in their scientific endeavors, and feel included in departmental activities and in intellectual networking needed to succeed in science. After tenure, many senior women employees felt marginalized; there were differences in salary, in amount of nine-month salary paid from grants, in access to space and resources, and inclusion in positions of power and administrative responsibility within departments or within the broader MIT community. These differences resulted in women having less or being excluded from important professional opportunities. As a result of the study, the administration improved the status and equitable treatment of senior women faculty, promoted integration and prevented isolation of junior women staff so as to increase the number of women. The family-work conflict was addressed, relying on advice from appropriate women, in order to make MIT more attractive to junior women staff and to encourage more women students and post-docs to continue in academic science³.

What is the situation of women scientists in developing countries' science institutions?

Accurate data on the participation of women and their contribution to the workforce of science in many developing countries are mostly deficient or inaccurate.

In Africa and other developing countries United Nations Millennium Development Goals (UN/MDGs) and beyond 2015 data show that:

For Goal 3: "Promote gender equality and empower women".

Eliminate gender disparity in primary and secondary education by 2005 and in all levels of education by 2015:

- There is progress in reducing gender gaps in primary school attendance.
- Girls still have barriers to schooling (N. Africa, S.S. Africa and W. Asia)
- Access to secondary and university-level education is unequal in different countries.

However other barriers have been noted e.g.

- Cultural: males are given priorities in education and jobs as they are always seen as the family financial supporters.
- Social: women's role as the family caretakers for housework, cooking, child care, nursing of the sick etc... is still the precedence over their professional jobs.
- Violence against women is increasing in many areas especially where wars and conflicts occur.
- There are larger numbers of single females as head of family and supporters.
- Political instability and low economy in many countries have greatly affected women employment and their jobs.

Situation in Sudan: Higher education

The 'Gordon Memorial College' (GMC) was established in 1902 as a primary school for boys. The "Kitchner School of Medicine" (KSM) was founded 1924. GMC and KSM were merged in 1951 into the University College of Khartoum which was named as University of Khartoum in 1956, after independence of the country. Khalda Zahir (1925 - 2015) was the first Sudanese woman doctor who graduated in 1952 from Kitchener Medical School. She later specialized as a pediatrician and became a leader of the women movement to participate in politics and empowerment. Gradually, the numbers of female students increased until they are exceeding 55% of the intake, while some faculties have much more.

Female education: The Ahfad University for Women, a private institution established in 1966, originated in a school for girls created in 1907 by Sheikh Babiker Badri. Over time it developed into a unique leading private institution which has clearly impacted women education, training and participation in several fields.

Higher Education Revolution (1990):

The higher education revolution took place one year after the regime took power in 1989 was projected for expanding the higher education in Sudan to meet the needs of the country's economic development. It was designed to Arabicize, Islamize, and expanded Sudanese higher education extensively where new universities, colleges and institutes were established in many states. However, the majority of the new institutions were centered in the capital city of Khartoum. Instead of opting for gradual implementation, the Arabicization of curriculum was a political decision executed in a hasty manner and Arabic became the official language of instruction in all social, human, and some natural sciences in the academic year 1990-1991. The process was introduced without adequate teaching materials available in Arabic, and many of the teaching staff was deficient and untrained for teaching in Arabic².

The education revolution also encouraged growth in privately owned academic institutions, mainly also in the capital city of Khartoum and gradually extending to other states. Unfortunately, most of the newly established institutions lacked adequately trained teaching staff, facilities and carefully constructed programs of study. This has resulted in a deterioration of the academic system and most of the new institutions are not internationally accredited. Moreover, due to the high costs imposed on the public high education system, students' have to pay tuition fees and cover their accommodation expenses. This has led to negative social costs on students and their families. In order to contain these effects, the government established a Student Welfare Fund to administer the housing of public university students, which also had extensive financial constraints. All of these changes affected the educational potential of the students and their staff. The private institutions similarly had to elevate their fees. Furthermore, the large number of graduates was not accommodated in the labor force and rate of unemployment increased or they had to take minor jobs not related to their university training. Migration of large numbers of trained academicians, skilled professionals and fresh graduates increased extensively to the nearby Gulf countries and Saudi Arabia for better payment. Many of those who are keen on post-graduate training also had to seek it outside the country.

At present, there are more than 46 universities dispersed all over the country, of which:

- 27 public and 19 private with about 30 in Khartoum
- 44 medical schools, 23 public and 21 private,
- 32 schools of agriculture, environment and veterinary sciences in different states mainly public institutions.
- 7 schools of pharmacy and 18 colleges of nursing.

For engineering education there are:

- 14 government institutions and 10 private
- 19 public technical colleges in different states with only one in Khartoum.

Other colleges for computer sciences, social sciences and Islamic studies are also available.

Enrolment of girls frequently exceeds that of boys, and sometimes reaches up to 70% of the total intake. There are currently large numbers of female graduates unemployed and ready to try new jobs to earn a living. Many females register in post-graduate training mostly privately sponsored.

Participation of women in labor force is much below that of men i.e. 25.5% vs. 60.2% (Labour Force Survey 2011, Min. of Human Resource Development & Labour, 2013). An interpretation (SSOM Nour, 2014) indicates that unemployment is due to endogenous and exogenous causes. Analysis of the high incidence of unemployment among youth population have clearly designated that there is high disparity between educational qualifications (supply) and labour market requirements (demand). It is suggested that actions should be in wide-ranging areas of structural reforms to improve the business environment, encourage private sector investment, stimulate productivity growth, and enhance efficiency.

- Emigration of academics and skilled professionals due to paucity of chances and external funding support increased extensively in the past few years. The rate of emigration among females is low, but is lately increasing. This has led to serious effects on the services e.g.
- Disruption in work force renewal,
- Lack of training and retention of workers
- Reduced transfer of staff to rural areas
- Inadequate creation of jobs
- Limited expansion of services
- Recruitment of new workers (non-Sudanese)
- Lack of jobs in public and private sector, together with the challenges of unskilled workers

- Academic staff who are currently available are over-burdened and many of them teach in more than one institution on a part-time basis
- Retirement age increased to 65 yrs and many institutions still keep some retired staff on annually renewed contracts.

How can Sudanese women harness their talents in science and technology for a more prominent presence in the workforce and academia?

There are many challenges women have to overcome i.e.

- Need to balance career and family demands.
- Social responsibilities to play the role of the family caretakers (housework, cooking, child care, nursing of the sick and extended family obligations) are preceding academic and employment tasks.
- Culturally in Sudan, as any Arab Muslim country, males are generally given preference in education and jobs as they are always considered the family financial supporters.
- The fragile economic conditions in Sudan are a major hurdle towards sustainable development
- Political sanctions on the country are affecting the economy and livelihood of the population extensively.
- Few opportunities of scholarships for training abroad and funding of research. The majority of young scientists have to be trained locally with many limitations imposed by conditions of the country.

Sudanese women scientists can emphasize their role in social and economic development of the country in addition to scientific advancement through:

- Having more women scientists in the top-level decision-making roles in academia, government and industry to endorse policies that promote gender equality and convince policymakers to realise significance of the gender gap in science and technology.
- Building networks and support systems to help women scientists maintain a healthy and productive work-life balance.
- Strategies and activities that promote greater interest in science and engineering among girls and young women must be encouraged regularly.
- Mentoring and guiding for women researchers to stay in science fields.

- Institutional reforms for more family- friendly measures and regulations.
- Men to take equal responsibilities in domestic work and child care.
- Perpetual public awareness about girls and women fully participating in science
- Young male scientists to realize share and work with female scientists so as to walk together towards sustainable development at home and at work.
- Women in science and technology should establish women's organizations in different working institutions for integrated workers support

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