Undergraduate medical students' research in India

In India, medical education has remained more or less static, and research is in a very poor state. Against this backdrop, the idea of promoting research culture at the undergraduate level may look very unrealistic. Yet, as discussed below, there is a silver lining. Students seeking admission to medical colleges are extraordinarily bright. A fair number of them have also shown research aptitude. This was evident from the popularity of the Short Term Studentship (STS) program of the Indian Council of Medical Research (ICMR). The program enables recipients to undertake research for two months and the students receive a token amount and a certificate on submission of a project report. The enthusiasm exhibited by the delegates of the two National Medical Students' Research Conferences held in Pune under the banner of the Moving Academy of Medicine and Biomedicine in October 2006 and February 2008 is yet another case in point. Students' presentations were of high quality, and their motivation for research could be judged by the fact that they not only passed a resolution for converting this initiative into an annual feature but also decided to form an "Indian Forum for Medical Students' Research". This is a historic development in medical sciences in India. This editorial gives a bird's eye view of the current status of undergraduate medical research and discusses the steps that need to be taken to promote research at the grass root level.

At the time of independence in 1947 India had just 20 medical colleges admitting about 3000 students. Sixty years later the number of colleges has increased 13 - fold and the number of seats has reached to 30,000.[1] Despite the numbers quality still remains a major issue. Majority of colleges lack even the minimum infrastructure. Teaching is mostly didactic with little emphasis on practical knowledge or patient care. The concept of evidence based medicine is almost nonexistent in the majority of colleges.[2] This dismal state is no different than that was prevalent in the medical schools in USA at the turn of 20th Century that resulted in appointment of the one-man commission of Dr. Abraham Flexner.[3] Implementation of his report resulted in the closure of 60% of the medical schools between 1910 and 1935.

This poor state of medical education has adversely affected research, the mother of new knowledge. Medical research, which on paper is an integral part of medical education, is perhaps the most neglected field in a large majority of our colleges. Analysis of the data provided by Index Medicus indicates that, in 1998, globally 416,561 were published of which India's share was only 0.714% (2974 articles).[4] A large number of medical colleges do not even publish a single paper in a year. A number of reasons can be cited for the poor state of medical research in India. (1) Most of the colleges both in public and private sector lack even the minimum infrastructure due to gross shortage of resources, both money and trained manpower. (2) Frontiers of medicine and biomedicine are expanding exponentially, but the process of tuning of teaching curricula to new knowledge is sluggish resulting in an ever-increasing gap between *what is known and what is taught* adversely affecting research. (3) Faculty, and in consequence the students, are hardly exposed to the latest tools in biomedical research and so feel shy of using modern technologies for research. In this atmosphere most teachers lack confidence in developing research project/s. All funding agencies have major programs for medical sciences. But there are hardly any takers.

Medical students' research in India faces several challenges. The students should have sound scientific foundation and the research should be tuned to the changing health scenario. One of the major recommendations of the Flexners' report was "*Medicine is a science and only on its strong foundation can the art of the practice of medicine be built*". No wonder that the American medicine never looked back after Flexner's report was implemented. These recommendations are relevant to every nation to make medical education and research globally competitive. Any nation, which is unable to do so, is doomed to fail.

Although infections still constitute major disease burden, non-communicable disorders can no more be ignored. India will be the *Diabetic Capital* of the world accounting for about 20 % of the world diabetic population by 2025.[5] The story is no different for other non-communicable disorders. Etiologies of these disorders are complex as they are multi-factorial involving interaction of genes with life style. Well-planned clinical translation research is essential to develop new approaches for their control.

Research would also play pivotal role in industry-academia interaction so essential for development of medically related products. In the next five years biotechnology market in India is expected to be US $ 5 billion creating one million jobs through products and services.[6] Medical and health related biotechnology, in which medical colleges would play a crucial role, would account for 60% of the growth mainly through vaccines, diagnostics and biopharmaceuticals. For these reasons India will have to develop a strong base for translational research - especially clinical trials. There is an urgent need for restructuring of medical education and research to meet these challenges. All this should start at the level of undergraduates.

Several committees have been appointed to advise the government on the formulation of a National Health Policy

including manpower development.[7] The main purpose of these committees was to advise the Government on restructuring of the medical and health services and gear medical education to meet the national needs for medical and health services. In Independent India, medical education was therefore tailored to the creation of a 'basic community oriented doctor'. Reforms in medical education in the context of the modern trends or changing disease epidemiology were never a part of the mandate of any of these committees. No committee/commission has addressed the issues of the poor state of medical research.

Research

Declining interest of medical fraternity in research is a global phenomenon. Only 4% of MDs (15,377 out of 391,889) reported research as their priority in 1980 in USA. Seventeen years later the figure dropped to 2.3% (14,434 out of 620,472).[8] There was thus a drop of 57.5% in the proportion of MDs (MBBS of India) interested in research. On the other hand Indian scenario is quite encouraging. The number of students availing STS has progressively increased from 495 in 2005 and 613 in 2007 to 889 in 2008.[9] At any given time there is a total of ~100,000 undergraduate medical students in India. This would mean that 0.9% medical students even in the prevailing adverse atmosphere evinced research aptitude. The scholarship is often given only once during the undergraduate studies. The 5-year cumulative figure would indicate that approximately 4.0 % undergraduate students are interested in medical research, a figure no different from the USA statistics.

Distribution of the STS scholarships is skewed [Figure 1] with colleges in Southern and Western (SW) states having about 3 times the number of winners as compared to those in North and East (NE). The pattern remains the same even if the results are expressed as STS per college or per 100 students (data not shown) and the problem needs to be addressed.

In the history there are a number of examples of medical students making path breaking research contributions. Islets of Langerhans were discovered by a 22 year old German medical student, Paul Langerhans, in 1869. Charles H. Best played a pivotal role in the discovery of insulin when he was a student. The discovery fetched the 1923 Nobel prize in Physiology and Medicine to his mentor Dr. Banting, ignoring Best's contribution. To complete the story so incensed was Banting at this omission the he later shared publicly 50% of the prize money with his student. There are a number of instances of medical students authoring research publications.[10] Obviously, given the proper environment students could contribute in a major way to scientific research.

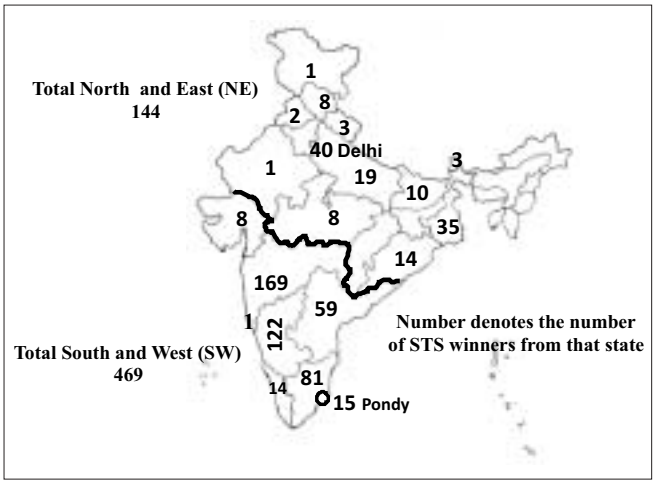

Figure 1: Distribution of STS scholarship winners 2007

Medical Students' Research Conference

This was the motivation behind author's initiative of organizing *Undergraduate Medical Students' Research Conferences*, under the banner of the Moving Academy of Medicine and Biomedicine in October 2006 and February 2008 in Pune. The idea was to nurture exceptional students with research aptitude before they get lost in the maze of service oriented clinical practice.

Students responded to this initiative enthusiastically. Some 300 research abstracts were received from all over India making selection highly competitive as only 128 abstracts were finally chosen for the first conference. Some 350 abstracts were received for the next conference. Unfortunately, only 190 (70 platform and 120 poster presentations), could be accommodated. In addition some 11 abstracts were received from students of other Asian nations, although actual attendance of the foreign delegates was very disappointing. This might be due to the fact that it was the first initiative of its type. But a number of faculty members from adjoining Asian nations like Pakistan, Sri Lanka and Thailand participated in the conference. The spectrum of abstracts received in the two conferences is given in Table 1.

The conferences received generous support from the ICMR and other national funding agencies and a special grant from Sir Dorabji Tata Trust. The last conference was sponsored by the ICMR. Students got ample opportunities to present and discuss their research through platform and poster presentations. Three best papers in each category received special awards.

Every student with research aptitude should get an opportunity to present and discuss his/her work at a common forum. This could be achieved only by hosting regional conferences annually on rotation basis in colleges in different regions. Some 10-15 best papers from every region should be short-listed and invited to participate in the annual National Medical Students'

Table 1: Discipline wise distribution of abstracts

Discipline	First conference. (October 2006) (n=130)	Second conference (February 2008) (n=181)
Clinical	68 (52.3)	66 (36.5)
Preventive and social medicine	34 (26.2)	53 (29.3)
Laboratory	15 (11.5)	44 (24.3)
Experimental	13 (10)	18 (9.9)

Figures in parentheses indicate percentages

Research Conference that should also be held on rotation basis in different regions.

Research Training Programs

Presentations both platform and poster, were of very high quality. However it was felt that students' performance would improve considerably if they undergo short-term training in basic research methodologies. Recognizing the importance of medical research at the graduate level the NIH has two major training programs for medical students. Medical Scientist Training Program (MSTP), that offers the combined MD-PhD degree, was launched in a few medical schools in the mid sixties.[11] The basic objective was to train the medical graduates in both biomedical sciences and clinical research so that they are better placed to bridge the gap between basic science and clinical research. The program is now in vogue in more than 100 medical schools. Some 600 MDs (4%) enrollees opt for MD-PhD program and this number has remained more or less steady for the last 20 years.[11] Although it is now showing some promising results it still has a long way to go; it has certainly not decreased the number of MDs going for medical practice.

The NIH Short-Term Research Training Grant (STRTG)[12] is intended to provide introductory biomedical research experience for students during the summer between their first and second year of medical school. The STRTGs are availed by a very large number of mixed populations of students many of them may be just casually interested in research. The main objective of the scholarships is to give research flavor and thereby inculcate the culture of enquiry irrespective of whether the participants ultimately engage in community practice, become academicians or full time researchers.

MD-PhD program, which attracts only highly motivated students committed to make medical research as their career, is about two years longer than the duration of the MD (equivalent of MBBS) course. This has serious implications to India, where recruitment is often at the lowest level of the ladder and promotion only by seniority. There are very few lateral entries. If the course were to be implemented in India students who would opt for the combined degree will be junior to their counterpart taking only the medical degree (MBBS) throughout their career. Also most of the medical colleges lack even the minimum infrastructure to support such a highly research biased course.

In spite of these limitations, there is a need to launch the program at least in medical institutes and colleges that have the necessary infrastructure so as to provide opportunity to highly committed research oriented undergraduate medical students. However, considering the ground realities the best approach would be to develop in-study research training programs. This is taken care of in the "Kishore Vaigyanik Protsahan Yojana" (KVPY) program[13] which was started during 1999 by the Department of Science and Technology, Government of India to encourage students of Basic Sciences, Engineering and Medicine to take up research careers in these areas. The aim of the program is to identify and encourage talented students with aptitude for research. The KVPY program strives to assist students to realize their potential and to ensure that the best scientific talent is developed for research. Generous scholarship and contingency grant is provided to the selected students. The program runs concurrent with the medical studies and unlike MD-PhD program does not prolong the duration of the medical course.

Should training in research methodology be made a compulsory part of the undergraduate studies? Medical curricula are already over burdened and, as mentioned earlier, most of the students are examination oriented and would hate additional burden of research-oriented programs. In any case research is not the forte of majority of students. Focus should be therefore on strengthening of the highly popular STS program of the ICMR. To improve the performance of the STS winners it is necessary to conduct short duration (2-3 days) workshops on research methodology including biostatistics and ethics. In fact depending on the project undertaken the recipient should also be exposed to techniques that would be used in the investigation.

Short duration training programs in research methodologies are in vogue in a few medical colleges. One of the best is run in GS Medical College, Mumbai by the Department of Clinical Pharmacology. It is a popular ten-week weekend certificate course in clinical research. The Academy itself conducts a highly rated two-week hands-on training course on laboratory medicine that includes commonly used techniques in cellular and molecular medicine for doctors.

By voluntarily joining such programs these students have shown a special aptitude for research and in the process destroyed the myth that young medicos are not interested in research.

Future

The concept of research at the level of undergraduate medical students has a bright future. But it would need tremendous commitment from the faculty. Medicine continues to attract some of the best talent in India. Some 75,000 applicants appear for the competitive examination for 33 General Catogory open seats at the All India Institute of Medical Sciences giving every aspirant a 1:2200 chance. As opposed to this scenario there were 42,315 applicants for MD (MBBS) course in 2007 in USA. Out of these 17,759 finally were admitted in 2007[14] (a chance of only 1:2.5).

Yet, majority of students are examination oriented and are quite contented to follow the prescribed syllabi. However, 10-15% students are knowledge hungry and a very small percentage (1-2%) is also interested in research. These students are crucial for generation of new knowledge. Routine teaching is not very exciting for them. They need to be nurtured through special supplementary educational programs.

Another promising development is the above-mentioned research conferences. At the feedback session the delegates

were all unanimous that the event should be continued and made an annual feature finally converting it into a *Medical Students' Science Congress* and, further, it should be gradually internationalized. Another recommendation was to hold regional meetings to give opportunity to larger number of students. Also there was a need to conduct multiple short duration regional workshop on research methodologies including documentation of results and bio-statistics. They also passed a resolution to form an all India Medical Students' Research body. Subsequently, they have informed the Academy that the proposed organization would be named "Indian Forum for Medical Students' Research". Its motto will be "Observation Beyond Vision". The Academy has agreed to work with students to facilitate the creation of such an organization and also help them for the next few years to conduct regional and national medical students' research conferences. It is hoped similar organizations will be established in other nations making undergraduate medical students' research a global feature. Success of these novel initiatives would need tremendous support from the entire medical fraternity and our funding agencies. We sincerely hope both will measure up to these expectations.

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