INTRODUCTION
In the early 1990s a decision was made by the Government of Pakistan that permanently changed the face of medical education in the country. Before then, admission in medical colleges was influenced, among other things, by the gender of the student. There were limited seats for female students, and the larger proportion of seats was for male candidates. Since admission was based on Higher Secondary School Certificate (HSSC) examination results, this quota system resulted in a gapping difference between the merit levels for the two genders, with the merit for girl students sometimes exceeding that for the Male students by 75–100 marks. The government abolished the gender based quota system, and a single merit level was set for all applicants. The effects of this decision have been profound. All medical colleges witnessed an immense influx of female students, with the female to male ratio sometimes reaching 75:25. The merit level soured, and we were eventually producing many more female than male doctors. Later on, the merit system was replaced by a competitive entry test, with final admission being based on a combination of HSSC results and entry test results. This change did not have any significant impact on the gender disparity being witnessed, with female students still outnumbering male students very significantly. The perception that this may be a transient phenomenon has also been disproven with the trend still persisting about 15 years after the initial policy change. The long-term consequences of this process are debatable, but some interesting observations and intriguing questions are highlighted by these developments.

A few things became very obvious in this situation. Female students were uniformly performing better than male students in both the board examinations and in medical colleges, and this hasn’t changed over the last 15 years. This situation raises numerous academic and research questions. Are female students more intelligent or capable than male students, or does our examination system put them at some advantage? Are they more hardworking, or is there some other reason for their consistently better performance? With this background scenario, we decided to embark on a study that could shed some light on the situation.

The current article is the first of a series; based on the preliminary data from a wide study that attempted to answer the following questions: (1) Do female medical students perform systematically better than male students on unbiased intelligence tests? (2) How do the scores achieved on these intelligence tests correlate with students’ scores in board examinations, and medical college entry test results?

The specific objective of the current research article is to assess whether there is any statistically significant difference between male and female medical students in scores on a structured, standard, robust test of intellectual ability.

MATERIALS AND METHODS
The study methodology was a cross-sectional, comparative research. We aimed for a sample size of 150 students, 75 male and 75 female students. The research was carried out in 2003–2005 in a well reputed medical college based in an urban city of Pakistan.

Medical students from 1st and 2nd years were randomly selected through their college roll-numbers. They were explained about the research, and were
The results obtained in the study revealed that significantly more male students scored in the "intellectually superior" category (Grade I) as compared to the female students. There were roughly the same percentage of females and males in the "above average" category (Grade II), while significantly more females scored in the "intellectually average" category (Grade III). When we plotted the data in a graphical chart, we saw that the scores of both groups fell into a bell curve (which was expected) but the bell curve for the male students was significantly shifted to the left (towards the higher score range) as compared to that for the females. The summary of the results is that, on the Standard Progressive Matrices test, the male students as a group, scored higher than the female students as a group, and the difference was statistically significant ($p=0.015$).

**DISCUSSION**

The results of this study need to be interpreted and understood in the light of previous research on the subject.

Studies carried out in various parts of the world have revealed a gradual increase in the proportion of female students in medical schools, but this has never been as drastic as that seen in Pakistan. Hall et al examined trends in applicants to US medical schools from 1974–1999 for changes in demographics, and found that female applicants increased from 20% of the pool in 1974 to 45% of the pool in 1999. Similar gradual increase have been documented by Hinkley in Florida, Colborn et al in South Africa, and again by Cooper in Wisconsin, but as noted above, none of these changes have been as marked as that seen in Pakistan during the last 15 years. Furthermore, the possible reasons for such a major shift are also difficult to identify from the available literature. The possible causative factors could be biological, environmental or social, as explained below.

Haier, Luders and their associates carried out research studies on brain anatomy, general intelligence, and gender differences. They reported that the brains of men and women do differ physically. Men have larger brains than women by about 8–10%, but the female brain often has a larger corpus callosum. Women’s brains were also seen to possess deeper fissures and sulci. At a cellular level, women had nine times more white matter in areas of the brain associated with intelligence than men did, while men had six times more grey matter in these areas. But since the men and women achieved similar IQ test results, the researchers concluded that the different types of brain architecture lead to comparable overall intellectual performance.

Other studies consistently show that the average IQ scores of men and women are equivalent. However, some gender-specific findings persist; viz. men tend to perform better on spatial questions, while women outpace men on reading and other verbal skills. Men

### Table-1: Standard Progressive Matrices (SPM) grades of the study subjects

<table>
<thead>
<tr>
<th>SPM Grade</th>
<th>Female (n=75)</th>
<th>Male (n=75)</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>I &lt; 75th percentile</td>
<td>36</td>
<td>34</td>
<td>0.02</td>
</tr>
<tr>
<td>II ≥ 75 percentile</td>
<td>39</td>
<td>36</td>
<td>0.09</td>
</tr>
<tr>
<td>III 25–75 percentile</td>
<td>29</td>
<td>38</td>
<td>0.01</td>
</tr>
</tbody>
</table>

**Statistical significance of difference ($p<0.05$)**

**Figure-1: Comparison of SPM categories among male and female students**

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score more at the extremes of IQ scoring — both high and low.

Morley and Toga have focused on the possible genetic influences and their interaction with the endocrine system. Sex hormones, such as testosterone and oestrogen, appear to have a role in brain development and function. Furthermore, cognitive abilities in one individual can change along with hormonal fluctuations. This has been documented throughout the menstrual cycle for women and even daily and seasonally in men as testosterone levels change.

So, what could account for the small but significant gender difference that we saw in our study? There are a number of possible options; (1) Because of the relative male advantage in spatial tasks, the SPM (being a pattern completion test) could have contained a small systemic bias in their favour, or (2) It was seen that the main difference between the SPM scores was in the highest grade, which could reflect the same finding as reported above, that males are over-represented in the extremes of the IQ scores. (3) The difference could be the result of several factors acting together (menstrual cycles, environmental and social influences, etc). (4) The finding could be a statistical error due to a small sample size, or (5) It could be a real difference documented by the study.

But that brings us to another question. If the male students performed better, or at least as well as the female students, how do we account for the gross over-representation of female students in medical colleges that we set out to study? One thing we can say, with some certainty now, is that it is not due to a systematic difference in intellectual abilities. That means we will have to look elsewhere for the answers. Other possible factors could be social influences (the greater acceptability of ladies in the medical profession versus other fields), environmental factors (female students being less influenced by negative external and peer pressures leading male students to activities besides studying and career building), or even psychological factors (female students having to prove themselves in a male dominated society may become more hardworking and motivated in the process) etc. but these are all untested hypotheses and research questions for the future.

CONCLUSIONS

In contrast to the huge influx of female students in medical colleges, the systematic difference in performance on the SPM inclines in favour of the other gender group.

More research needs to be carried out into the other possible factors as discussed above, which could explain this interesting phenomenon. Future research studies in this subject need to include many more possible variables, since multiple influences may be acting in confluence to give rise to this difference. Furthermore, the sample size in future studies would have to be larger to arrive at more robust results.

REFERENCES


The contents of this original research and any opinions expressed in the article are strictly those of the authors as health professionals, and are not expressed in the first author’s official capacity as a United Nations staff member.

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