



BMJ Open Extent of awareness and attitudes on plagiarism among post-graduate resident doctors and junior medical faculty in India: a cross-sectional, multicentric study

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ABSTRACT

Objectives Though dissertation is mandatory for postgraduates (PG), it is unknown if adequate knowledge on plagiarism exists at that level. Thus, we intended to study the knowledge and attitude towards plagiarism among junior doctors in India.

Design Cross-sectional study

Setting PG medical residents and Junior faculty from various teaching institutions across south India.

Participants A total of N=786 doctors filled the questionnaires of which approximately 42.7% were from government medical colleges (GMCs) and the rest from private institutions.

Methods Participants were given a pretested semistructured questionnaire which contained: (1) demographic details; (2) a quiz developed by Indiana University, USA to assess knowledge and (3) Attitudes towards Plagiarism Questionnaire (ATPQ).

Outcome measures The Primary outcome measure was knowledge about plagiarism. The secondary outcome measure was ATPQ scores.

Results A total of N=786 resident doctors and junior faculty from across 11 institutions participated in this study. Of this, 42.7% were from GMCs and 60.6% were women. The mean (SD) knowledge score was 4.43 (1.99) out of 10. The factors (adjusted OR; 95% CI; p value) that emerged as significant predictors of knowledge were number of years in profession (−0.181; −0.299 to −0.062; 0.003), no previous publication (0.298; 0.099 to 0.498; 0.003) and working in a GMC (0.400; 0.106 to 0.694; 0.008). The overall mean (SD) scores of the three attitude components were: Permissive attitudes—37.33 (5.33), critical attitudes—20.32 (4.82) and subjective norms—31.05 (4.58), all of which corresponded to the moderate category.

Conclusion Participants lacked adequate knowledge on how to avoid plagiarism suggesting a need for a revamp in medical education curriculum in India by incorporating research and publication ethics.

Strengths and limitations of this study

- It is a large multicentre study covering a vast geographical area and representations with different types of institutional management.
- Validated scales have been used to assess the outcome measures.
- The predictors of unacceptable attitude may not be truly representative as the knowledge on the topic was assessed to be inadequate.
- Generalisability of results to all medical institutions of the country is not possible as there was no representation from the top 31 medical institutions who were the highest contributors of research output in the India during the 10-year period from 1999 to 2008.

INTRODUCTION

The office of research integrity defines plagiarism as ‘the appropriation of another person’s ideas, processes, results or words without giving appropriate credit.’¹ The term plagiarism is derived from the Latin term ‘plagiarius’ which means ‘kidnapper’ or ‘abductor’. In simple words it means to steal another person’s work or ideas without acknowledging the person.² Lot of factors lead a researcher to plagiarise and some of the important ones include pressure to publish and easy availability of online text.³ Plagiarism has been documented under various settings such as medical, dental, literature, art, engineering and management professionals.^{4–7} For instance, a study conducted among dental professionals from north India,

reported that 87% of the respondents had plagiarised at least once before.⁶ Another study conducted among undergraduate medical students concluded that the knowledge score regarding plagiarism was very low with just 16.3% (n=69/423) scoring above 70% and the score was positively correlated with attitudes that were critical of the practice.⁷ With a mounting pressure to ‘publish or perish’, the menace of plagiarism has grown rampantly among medical fraternity.⁸ Besides this, the education system in India has no formal training on plagiarism education, research ethics and publication ethics and there is no policy that governs academic integrity. Though at the postgraduation (PG) level, it is mandatory to undertake a scientific research project and submit its report as a dissertation, it is still unknown whether the doctors have adequate knowledge on plagiarism. Poor knowledge is itself a risk factor for plagiarism and also leads to unintentional plagiarism. There is very little information on the extent of this problem in India. (PubMed search using search string “Plagiaris* AND India*”). Therefore, we proposed to do a larger multicentre study to measure the extent of knowledge and attitudes towards plagiarism among postgraduate medical students and junior faculty in India so that the regulatory authorities and medical universities can initiate efforts to educate Indian medical fraternity on research ethics if any caveats are identified.

METHODS

A written informed consent was obtained from all the participants.

Study design and eligibility criteria

It was a multicentre, cross-sectional study conducted over a 2-year period from January 2018 to December 2019. An equal number of government medical colleges (GMC) and private medical colleges/academic institutions (PMC) were selected based on convenience. All junior doctors in the cadre of tutor/demonstrator (completed internship post MBBS but not yet enrolled in a PG course), junior resident (Currently pursuing broad specialty PG such as medicine, surgery, etc), senior resident (completed broad specialty PG or pursuing super-specialty training such as cardiology, urology, etc) and assistant professor (1-year senior resident experience post broad specialty PG or completed super specialty training) of the selected institutions were counselled for participation in the study. Those who did not consent, were excluded.

Sample size estimation

The estimated prevalence of junior faculty with poor knowledge on plagiarism (p) was considered as 40%.⁸ Considering an alpha error of 5%, power of the study as 80% and a relative precision (d) of 10% of p, the sample size calculated using the formula $(Z_{\alpha})^2 pq/d^2$ was 600. Considering each department as a cluster with an estimated cluster size of 20 junior faculty the design effect (DE) was calculated using the formula, $DE=1+(\text{cluster$

size -1) p. Rho (ρ) was arbitrarily taken as 0.1 and therefore the calculated DE was 1.19. Accounting for this effect, the sample size calculated was 714. Further accounting for non-responders, we decided to increase the sample size by 10% and the final sample size was 786 participants.

Study procedures

The junior doctors were met department wise after due permission from the head of the department. The study was explained to them in detail and those who consented to participate in the study were individually handed over a semistructured pilot-tested questionnaire comprising of sections to, (1) capture basic demographic details, (2) assess the extent of knowledge and (3) to assess attitudes towards plagiarism. The questionnaire was pilot tested among n=20 PG residents from different participating institutions who were not included in the study and it was found to take not more than 30 min to fill the questionnaire. The extent of knowledge was assessed using ten case vignettes (online supplemental file 1) that were developed as a quiz for graduates by Indiana University, USA⁹ and is freely available for use with due acknowledgement. They were slightly modified to simplify and make them suitable for Indian respondents. Each vignette had a student’s version that had to be compared with the original version and identify if there was plagiarism on the first place and if present whether it was word-for-word plagiarism or paraphrasing plagiarism. The Attitudes towards Plagiarism Questionnaire (ATPQ)¹⁰ is a validated questionnaire that was used to evaluate attitudes. It comprises of 29 questions to evaluate three components namely: (1) ‘positive’ or permissive attitudes (items 1–12), (2) ‘negative’ or critical attitudes (items 13–19) and (3) ‘subjective’ or personal norms (items 20–29). High permissive attitude score indicates that the participant permits one’s self to plagiarise (unfavourable) but high negative attitude score indicates that the participant is against plagiarism (favourable). A high subjective norm scores indicates that the participant is aware of the prevalence of plagiarism around and just accepts it (unfavourable).¹⁰ The original version of the ATPQ validated by Mavrincac *et al*¹⁰ was used in our study. The face and content validity of the case vignettes and ATPQ, in an Indian context, was confirmed by a panel of 6 experts from the fields of bioethics, clinical research, psychology and medical education. The questionnaire was administered only in English language and no translations were used as the mode of education at the undergraduate level is compulsorily in English in all medical colleges of India. Also, the foreign medical graduates are also expected to be proficient in English as they clear a foreign medical graduates examination before they receive practising licence in India and the medium of instructions to clear this exam is also in English.

After data collection was complete at a particular site, an educative hand-out prepared by the study team was handed over to all the participants. A similar study was simultaneously ongoing among the undergraduate

students with a different set of collaborating institutions and a different methodology. Some of the institutions participated in both these studies and precautionary measures were taken to avoid contamination between the two populations. These measures include, deferring the educational intervention until data collection for both these studies were completed at that site and, utilisation of digital questionnaires displayed by the investigator instead of printed questionnaires to prevent internal circulation.

Data management

Data entry was done using Microsoft Excel (Publisher: Microsoft, Redmond, Washington, USA, 2016). Statistical analyses were performed using SPSS Statistics for Windows, V.20.0 (Publisher: IBM).

Statistical analysis plan

The demographic characteristics were summarised using descriptive statistics. The differences in score between PMCs and GMCs and between junior and senior residents/assistant professors were assessed using independent sample t-test. The number of participants in different categories of each attitude component was summarised using frequencies and percentages. χ^2 test and post hoc Beasley's technique were used to analyse significant differences in the number of participants in different categories of attitudes with regard to gender and the type of medical college being employed in. A simple Bonferroni's correction for p value was applied for the multiple comparisons pertaining to the type of medical college and the new level of significance was $p=0.008$. Univariate analysis using simple regression was then performed for

the hypothesised predictors of poor knowledge score and the three attitude components. Those predictors with $p<0.2$ were subjected to multivariate analysis using linear regression model. The statistical significance for all analysis was set at $p<0.05$.

Patient and public involvement

No patients were involved.

RESULTS

Demography

A total of $n=16$ academic institutions ($n=8$ GMCs and $n=8$ PMCs) across the five south Indian states and union territory of Pondicherry were approached. A total of 11 institutions gave consent ($n=4$ GMCs and $n=7$ PMCs). The geographical distribution of the colleges include $n=4/11$ from Karnataka, $n=2/11$ ($n=1$ GMC) from Tamil Nadu, $n=3/11$ ($n=2$ GMCs) from Kerala, $n=1/11$ from Telangana and $n=1/11$ (GMC) from Andhra Pradesh. The total number of junior doctors who filled the questionnaires were $N=786$ of which approximately 42.7% were from GMCs. The demographic characteristics are given in table 1. Their mean (SD) age was 27.86 (3.09) Approximately 60% were female participants and there was a good representation across all cadres of junior faculty. A vast majority of them (approximately 88%) had no publications in the past and 76% were not currently involved in any research activities.

Knowledge score and its predictors

The mean (SD) knowledge score was 4.43 (1.99) out of 10. The number (%) of participants who had scored nine

Table 1 Demographic characteristics of study participants

Characteristic	Statistic	Government college (n=336)	Private college (n=450)	Total (N=786)
Age	Mean (SD)	28.42 (3.49)	27.43 (2.70)	27.86 (3.09)
Gender				
Male	n (%)	109 (32.4)	201 (44.7)	310 (39.4)
Female	n (%)	227 (67.6)	249 (55.3)	476 (60.6)
Designation				
Non-PG Registrar	n (%)	10 (3.0)	7 (1.5)	17 (2.2)
JR-1	n (%)	125 (37.2)	125 (27.8)	250 (31.8)
JR-2	n (%)	97 (28.9)	118 (26.2)	215 (27.3)
JR-3	n (%)	87 (25.9)	125 (27.8)	212 (27.0)
Senior resident/assistant professors	n (%)	17 (5.0)	75 (16.7)	92 (11.7)
Previous publications				
Yes	n (%)	9 (2.7)	89 (19.8)	98 (12.5)
No	n (%)	327 (97.3)	361 (80.2)	688 (87.5)
Currently involved in research				
Yes	n (%)	47 (14.0)	141 (31.3)	188 (23.9)
No	n (%)	289 (86.0)	309 (68.7)	598 (76.1)

PG, postgraduates.

Table 2 Predictors of poor knowledge score

Predictor	Univariate analysis		Multivariate analysis		
	B-coefficient	P value	B-coefficient	95% CI	P value
Younger age	-0.027	0.241	Not included in analysis		
Male gender	-0.156	0.284	Not included in analysis		
No of years in profession	-0.114	0.055	-0.181	-0.299 to -0.062	0.003
No previous publications	0.310	0.002	0.298	0.099 to 0.498	0.003
Not currently involved in research	0.305	0.067	0.162	-0.168 to 0.493	0.335
Working in govt medical college	0.457	0.001	0.400	0.106 to 0.694	0.008

or above, which is considered the ideal score, was a mere $n=20/783$; 2.6% ($n=3/786$ did not complete the knowledge questionnaire). The mean (SD) score of participants from GMCs was 4.17 (1.97) and those from PMCs was 4.63 (1.98) and this difference was statistically significant ($p=0.001$). The mean (SD) scores among junior residents were 4.56 (1.96), and that among senior residents was 3.47 (2.00) and this difference was also statistically significant ($p<0.001$). The univariate and multivariate analysis of hypothesised risk factors for poor knowledge score are summarised in [table 2](#). The factors (adjusted OR (aOR); 95% CI; p value) that emerged as significant predictors of poor knowledge were early years in profession (-0.181; -0.299 to -0.062; 0.003), no previous publication (0.298; 0.099 to 0.498; 0.003) and working in a GMC (0.400; 0.106 to 0.694; 0.008).

Attitude towards plagiarism

Favourable attitudes signifying higher standards of academic integrity was seen in very few participants. The proportion (95% CI) of participants in the most favourable category for permissive attitudes, critical attitudes and subjective norms were 5.7% (4.2% to 7.6%), 6.1% (4.6% to 8.0%) and 4.9% (3.5% to 6.6%), respectively. The majority of participants were classified as moderate category with regards to all the three components as summarised in [table 3](#). The overall mean (SD) scores of the three attitude components were 37.33 (5.33), 20.32 (4.82) and 31.05 (4.58), respectively, all of which also

Table 3 Attitude towards plagiarism

Attitude	Category (Score range)	Frequency (%)
Positive/permissive attitude ($n=786$)	Low* (12–28)	45 (5.7)
	Moderate (29–45)	698 (88.8)
	High (46–60)	43 (5.5)
Negative/critical attitude ($n=783$)	Low (7–16)	148 (18.9)
	Moderate (17–26)	587 (75.0)
	High* (27–35)	48 (6.1)
Subjective norms/proxy for practice ($n=781$)	Low* (10–23)	38 (4.9)
	Moderate (24–37)	710 (90.9)
	High (38–50)	33 (4.2)

*Favourable attitude for academic integrity.

corresponded to the moderate category. There was no significant difference between the number of participants in the various categories of each attitude component with regards to gender distribution ($p=0.233$, 0.846 and 0.453, respectively). However, difference between the number of participants in the various categories of each attitude component with respect to being employed in GMC or PMC was statistically significant for positive attitudes and critical attitudes ($p=0.025$ and $p<0.001$ respectively) whereas it was not significant for subjective norms ($p=0.449$). A post hoc analysis revealed that 3.0% from GMC were categorised as high for permissive attitudes while it was 7.3% from PMC and this was statistically significant ($p<0.0000001$); 91.7% from GMC were categorised as moderate for permissive attitudes while it was 86.7% in the PMC and this was again statistically significant ($p<0.0000001$). There was no difference between groups in the low category for positive attitudes ($p=0.217$). With regard to critical attitudes, 10.7% from GMC vs 2.7% from PMCs ($p<0.0000001$) for high category; 76.1% in PMC vs 73.5% in GMCs ($p=0.0000001$) for moderate category and 21.3% in PMCs vs 15.8% in GMCs ($p<0.0000001$) for low category were all statistically significant.

Predictors of attitude

The univariate and multivariate analysis of the predictors of unfavourable attitudes for each of the three attitude components are described in [table 4](#). Of the hypothesised predictors (aOR; 95% CI; p value), not currently involved in research (-1.698; -2.567 to -0.829; <0.001) and knowledge score (-0.192; -0.379 to -0.005; $p=0.045$) were the significant predictors for positive attitudes score. Whereas, working in GMCs (1.459; 0.754 to 2.163; <0.001) was the only significant predictor for the score of critical attitudes. The significant predictors of the score for subjective norms were age (-0.139; -0.202 to -0.034; <0.001) no previous publication (0.915; 0.462 to 1.368; <0.001) and currently employed in GMC (-1.510; -2.194 to -0.825; <0.001).

DISCUSSION

We report that the knowledge regarding plagiarism is poor in our study population with the mean score less than 50% and a mere 2.6% scoring the ideal score of 90%. We also report that only around 5% of our participants fall

Table 4 Predictors of unfavourable attitudes towards plagiarism

Predictor	Univariate analysis		Multivariate analysis		
	B-coefficient	P value	B-coefficient	95% CI	P value
Permissive attitudes					
Age	-0.063	0.312	Not included in analysis		
Male gender	0.073	0.851	Not included in analysis		
No of years in profession	0.223	0.157	0.278	-0.037 to 0.594	0.083
No previous publications	-0.423	0.107	-0.328	-0.856 to 0.200	0.223
Not currently involved in research	-1.823	<0.001	-1.698	-2.567 to -0.829	<0.001
Working in Government Medical College	-0.472	0.220	Not included in analysis		
Knowledge score	-0.240	0.012	-0.192	-0.379 to -0.005	0.045
Critical attitudes					
Age	-0.188	0.001	-0.222	-0.332 to -0.112	<0.001
Male gender	0.170	0.630	Not included in analysis		
No of years in profession	-0.093	0.515	Not included in analysis		
No previous publications	0.149	0.533	Not included in analysis		
Not currently involved in research	-0.951	0.018	-0.451	-1.253 to 0.351	0.270
Working in Government Medical College	-1.417	<0.001	-1.459	-2.163 to -0.754	<0.001
Knowledge score	-0.151	0.080	-0.106	-0.276 to 0.063	0.219
Subjective norms					
Age	-0.091	0.091	-0.139	-0.202 to -0.034	0.010
Male gender	-0.084	0.802	Not included in analysis		
No of years in profession	-0.084	0.536	Not included in analysis		
No previous publications	0.631	0.005	0.915	0.462 to 1.368	<0.001
Not currently involved in research	-0.552	0.152	-0.290	-1.056 to 0.475	0.457
Working in government medical college	-1.170	<0.001	-1.510	-2.194 to -0.825	<0.001
Knowledge score	0.081	0.628	Not included in analysis		

in the favourable category of attitude towards plagiarism. The mean attitude towards plagiarism score in all the three attitude components fell in the moderate category.

These findings are similar to the findings of other studies.^{7 8} The study by Varghese and Jacob conducted among 423 Indian medical students from a single centre and published in the year 2014 reports that the mean (SD) knowledge score was 4.96 (1.67%) and only 16.3% have scored more than 70%.⁷ This suggests that there has been no change during the course of approximately 5 years with regard to educating medical professionals on the issues regarding plagiarism. The situation was no better in Pakistan, where faculty also demonstrated poor knowledge with regards to plagiarism.⁸

India is considered to be one of the leading nations in the world in terms of research publications, especially in the field of medicine.¹¹ During a 5-year period from 2011 to 2016, Indian institutions have published 789 089 papers out of the global output of 23 459 397 publication that corresponds to 3.36%. In the field of medicine, India's share was 13.2% during the same period (157 610 out of 4949 347 publications).¹¹ Given this scenario, it is pertinent that the country's younger generation of professionals should be trained adequately on all aspects of publication ethics such that unintentional errors do

not mar the integrity of the scientific community of that country at any time. Currently, publication ethics is not a part of curricula at the undergraduate and the PG level of medical education in India.

An analysis to identify the risk factors of poor knowledge revealed that a person in his/her early years of professional life do better than those little senior to them as the mean score is likely to fall by 0.18 units out of 10 for every 1-year increase in experience. This is well elicited by the fact that the actual scores obtained by the junior residents was significantly more when compared with the senior residents. The probable reason behind this finding is that there has been greater enthusiasm off late, even amidst undergraduate medical students to pursue research and therefore better exposure to research ethics when compared with their immediate seniors.¹² Further, a large number of research conferences targeting undergraduate medical students in India providing a platform for these students to present their work has given a major impetus to undertake research early.¹² As the current generation ages, we expect that this finding will soon change. On the contrary, those with no previous publications or being employed in a government institution are most likely to score less knowledge score. In the event that a person has at least

one publication, we report that the score is estimated to increase by an average of 0.30 out of 10. This suggests that there is knowledge gained out of experience but is obviously not to such an extent that is ideal, thus stressing the need for formal training.

Yet another risk factor for poor knowledge was the mere affiliation to a GMC. In the event that a person moves on from a GMC to a PMC one could expect a rise in mean score by 0.40 out of 10. The public hospitals in India face a lot of challenges some of which are the lack of infrastructure, deficient manpower and unmanageable load of patients. Thus, the priority for patient care takes much precedence.¹³ A report from the Lancet clearly states how research is not prioritised in medical colleges in India given the other challenges faced.¹⁴ This could be the probable reason for a comparatively poor knowledge documented in GMCs. However, with the recent support of the department of health research, government of India, multidisciplinary research units have been established since 2014 in government-run medical colleges with an aim of changing the existing scenario.¹⁴

We report that only a few participants had a favourable attitude towards plagiarism and a vast majority fell in the moderate category as reported by the previous studies.⁷ Although the mean knowledge scores of those from GMC were comparatively low, the proportion of participants from GMCs who had favourable permissive and critical attitudes was more compared with the PMCs. An analysis of the predictors of unfavourable permissive attitudes score revealed that for every unit rise in the knowledge score, the average permissive attitudes score is likely to decrease by 0.19 units which is favourable. This suggests that knowledge is one of the important factors that drive one's attitudes.¹⁵ Similarly, those who were currently involved in research work were less permissive such that, his/her average score of permissive attitudes is expected to be less by 1.698 units when compared with those not involved in research activities. On the contrary, a participant who gets his/her first publication is likely to have the subjective norms attitude score increased by an average of 0.041 units which is not favourable. This probably indicates that though at an individual level they do not permit plagiarism, those who have had a previous publication are not very sensitive about the others around them who plagiarise but just accept it.

With regard to critical attitudes, age was a significant predictor and we estimated that with every unit rise in age, the critical attitudes score is expected to fall by 0.202 units which is not favourable, and it corresponds to the poor knowledge seen among senior residents category as discussed earlier. The other significant predictor of critical attitudes was being employed in a GMC and we estimate that, in the event a person moves from a GMC to a PMC, their critical attitude component score is likely to decrease by 1.459 units which is again less favourable, thus corroborating with our earlier finding that the proportion of participants with favourable critical attitudes is significantly more in the GMC.

When it comes to subjective norms, age was again a significant predictor but however, we predicted that for every 1-year increase in age the average subjective norms score is likely to decrease by 0.139 units which is favourable. This could be explained by the fact that seniors in a working environment are usually in a much better position to voice out their opinion and not accept issues as is, if it contradicts their conscience. On a similar note, we found that those working in a PMC are most likely to have their average subjective norms score less by 1.510 which is again favourable. The most likely reason is that manpower and the resulting administrative oversight on juniors is more in PMCs when compared with GMCs who are hard pressed to even provide routine patient care.¹³

Our study has a few limitations. The ATPQ used in our study has not been systematically validated in an Indian context like how it has been validated in many other countries.¹⁰ However, it has been widely used in many studies from India.^{6 7 16-18} Even though we have taken efforts to identify predictors for poor attitude, we feel that the findings would most likely be restricted to the study population as the average knowledge score which the linear regression model would have considered as 'good' would have still been much below the ideal score. A study conducted among experienced researchers with good knowledge on how to avoid plagiarism, would have identified the real predictors of poor attitude toward plagiarism seen among Indian medical professionals. Third, although it was a multicentre study, the results may not entirely be generalisable to all medical institutions within the country. This is because we did not have representation from any of the top 31 medical colleges in India that were listed as the highest contributors of research output in the country during the 10-year period from 1999 to 2008.¹⁹

CONCLUSION

In conclusion, we state that the extent of knowledge on plagiarism among junior medical professionals in India is far from satisfactory. The probable reasons as evident from our study are that most of the participants had never published (88%) or were involved in research (77%) thereby lacking experiential knowledge. Also, there is lack of training on research and publication ethics and lack of policy regarding academic integrity. But ignorance cannot be considered an excuse to commit mistakes and a poor knowledge would be the main reason for unintentional plagiarism. We recommend that the universities include formal training sessions on publication ethics right from the undergraduate medical education as taking up research sometime in a medical practitioner's life has now become inevitable. Although there have been instances of authors facing serious consequences because of plagiarism, they are far few in number. This has resulted in many young researchers remaining insensitive towards plagiarism which in turn has reflected in the unfavourable attitude scores as assessed in this study. We

further recommend that the government of each country support and take-up initiatives to actively train the faculty and students on research ethics to prevent unintentional research misconduct.

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