



The Practice of Cramming among Pre-Clinical Medical Students and Their Remedial Examination Result: A Simple Preliminary Demographic Analysis

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Authors' contributions

This work was carried out in collaboration among all authors. Author FES designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors LSS and YHD managed the analyses of the study. Authors MA, JMC, ESA, LK and AHRF managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aims: To analyze the practice of cramming among pre-clinical medical students during the remedial examination based on their gender and place of residence, along with a review of the literature on the factors that foster this practice.

Study Design: Simple cross-sectional study.

Place and Duration of Study: Faculty of Medicine, Universitas Kristen Indonesia, Jakarta-Indonesia, throughout August 2022.

Methodology: Analysis of demographics data, gender and place of residence, of the cramming and non-cramming students, with the results of total 36 remedial exam scores for courses/block in the second, fourth, and sixth semesters.

Results: Out of 2413, 739 (30.62%) were male and 1674 (69.37%) were female, and 1054 (43.68%) live in boarding houses and 1359 (56.31%) live in their own private house. Cramming conducted by 1553 students (64.35%) consisting of 505 males (32.51%) and 1049 female (67.54%). Based on the total number of participants taking the remedial exam, the prevalence of cramming was slightly higher in male student (68.33%) compared to female student (62.66%). Based on their place of residence, most of the perpetrator live in their own house (n=935 or 60.20%) and 39.80% live in boarding houses (n=619). Statistic analysis using Pearson chi-square on the gender differences and place of residence in cramming behavior both were proved significant ($P=0.007$ and $P=0.000$). The average passing percentage of cramming perpetrator is only 43.13% with very low mean score (50.13). There is a reduction in the prevalence of cramming as the students reach higher level of education.

Conclusion: Cramming among medical students still a common practice although the success story regarding this activity is still questionable because there are still more perpetrators who fail the exam and do not reach the lower threshold value of passing.

Keywords: Autonomous learning; procrastination; health; male; female; substance abuse; addiction.

1. INTRODUCTION

Cramming per definition is an act to try to learn every examination related materials in a shortest time allocation that usually conducted due to previous intended procrastination, e.g., due to internet addiction; cramming usually conducted just the night before the exam [1,2]. Theoretically, postpone of studying until the night before an exam actually can fill a student's brain with a huge amount of information which was actually short-term memory [3,4]. In order to master it, the perpetrator to must actually compel his/her brain to selectively [5] and purposely choose which material to study in relation to the allocation of study time [6]; and by getting used to doing that, the perpetrators may feel very satisfied and increasingly shrewd, especially if the material they choose turns out to be the material being tested [1]. The right choose make wise decisions for survival and this sound like a gamble. When a student gets a good grade through cramming, he/she might potentially feel that rush of relief

associated with getting away with something [1,7]. Cramming itself can have direct and indirect effect to health, e.g., increased blood pressure, lack of sleep and emotional disturbance [1]. To the best of our knowledge, no studies have confirmed whether cramming is addictive.

The daily life of a university student, especially those from faculty of medicine, demands a lot; academically and socially [8]. For new students, the transition from the learning style of secondary education to the autonomous learning model of higher education is also a confounding factor, if adaptation to those changes is slow to occur [9].

Typical faculty of medicine focuses on a mixed of traditional class based lectures and integrated problem-based learning modules in delivering medical education that combined basic medical sciences and with skill's related clinical knowledge [10]. On the other hand, student's social non-academic activity also very

demanding [11]. Too much to do but too little time available.

Procrastination and cramming is completely common practice and widely justifiable among students and yet perhaps officially denied by their institution [1,12]. Along with this practice, especially in the long term, will caused sleep deprivation [13], blood pressure disorders [14], physical-mental-emotional disruption [15] and also substance abuse [16], e.g., tobacco or caffeine, in order to accomplish good marks and passing the exam [1].

In general, there are two types of exams in medical faculty, the regular one and the remedial.¹⁰ Regular exams are set of tests (theory and lab work) to measure students' academic abilities that are tested immediately after the learning process ends. When medical student got fail in any subject of those tests, he/she have to take a remedial exam to successfully clearly pass that subject in those semester in order to avoid having to repeat the entire subject in the following year. Most remedial exam takers are not the brightest students in class and often take more than one remedial exam subject at nearly the same time. There are allegations that students who prefer to do cramming do not just do it on one, but on many exams; so it seems to have become like a habit. There is also a possibility that the participants will become overconfident because they suspect that the exam questions will be repeated; [17] even though the exam questions that are tested are always new questions that have never been tested on regular exam.

Because of the uniqueness of the remedial exam model, this research is aimed at knowing the demographic background (gender and place of residence) of medical students who practice of cramming in taking remedial exams and a simple review of the literature on possible rationalizations that foster this practice. To our knowledge, data regarding cramming among medical students is lacking and sparse, especially in the remedial exam.

2. METHODOLOGY

This simple cross-sectional study observed the two demographics data available, e.g., gender (male/female) and place of residence (living in their own house/living in boarding house), which is regularly asked whenever students filled in their identity prior to computer based exam, comparing cramming and non-cramming

students, based on the results of the remedial exam scores for courses/block in the second, fourth, and sixth semesters of the Faculty of Medicine, Universitas Kristen Indonesia, Jakarta-Indonesia, which has been carried out throughout August 2022. This whole study (from planning, data collection, data analysis and written the manuscript) was conducted throughout August-September 2022.

The inclusion criteria in this study were active students who fill their demographic data completely and had remedial scores for each component of the course and if students do not have any of the relevant data (demography, cramming and grades) they will be excluded from the study. All data initially made available in Microsoft Excel™ and then further classified and processed using SPSS™.

Other sensitive data related to students 's personal information will not be displayed in order to maintain ethical values as well as to remain relevant to the research objectives.

3. RESULTS AND DISCUSSION

During data collection, 2413 students who took a total of 36 computer-based theoretical, and or practical/lab remedial, and or clinical skills exams were eligible to join the study. This remedial exam conducted after all the regular exams were carried out and the results are announced to students. For those who have not reached the lower pass threshold score (minimum 65) are required to take a remedial exam which is conducted only once for one subject.

The remedial exams in our faculty have been arranged in such a way that no two or more exams are conducted at the same time and it is expected that students will only take one remedial exam in one day so he/she can have sufficient time to prepare for the coming exam and to prevent students from the potency of cramming.

Demographically, 739 (30.6%) were male and 1674 (69.4%) were female. The gender ratio of our respondents generally represents the gender ratio of students in our institutions and also seems to be a general picture of a typical global medical school where the number of male students is less than female students (estimated ratio M:F=1:2+). Based on the place of residence, number of students living in boarding houses is 1055 (43.7%) and 1359 students (56.3%) live in their own private house. All data presented in Table 1.

Table 1. Demographic and characteristics of the respondents

Demographic		n (%)
Gender	Male	739 (30.6%)
	Female	1675 (69.4%)
Place of Residence	Boarding houses	1055 (43.7%)
	Private houses	1359 (56.3%)
The Practice of Cramming		n (%)
Did you cramming for this exam *Failed the exam if score achieved <65 and Pass the exam if score ≥65 Note: Percentage of passing the exam in the non cramming group 386/860=44.88% with mean score 76.31, and in sub group failing the exam, the mean score was 49.70 Percentage of passing the exam in the cramming group 663/1554=42.66% with mean score 75.55 and in the sub group of failing the exam, the mean score was	Not Cramming	860 (35.6%)
	Male	234 (27.20%)
	Failed; mean score	135/234(57.69%);48.05
	Pass; mean score	99/234 (42.3%); 76.55
	Female	626 (72.79%)
	Failed; mean score	338/626(53.99%);50.44
	Pass; mean score	288/626` (46%); 76.23
	Yes, Cramming	1554 (64.4%)
	Male	505 (32.51%)
	Failed; mean score	302/505(59.80%);49.81
Pass; mean score	203/505(40.19%);75.32	
Female	1049 (67.43%)	
Failed; mean score	809/1049(77.19%);50.3	
Pass; mean score	239/1049(22.8%);75.66	
Ratio of cramming perpetrators to the total population by gender		ratio
Ratio	Not Cramming	
	Male : total male	0.31
	Female : total female	0.37
	Cramming	
	Male : total male	0.68
	Female: total female	0.62
Cramming based on place of residence and gender		n (%)
Place of residence	Boarding houses	
	Male (n total=248)	168 (67.74)
	Female (n total=806)	451 (55.95)
	Own house	
	Male (n total=491)	337 (68.63)
	Female (n total=868)	598 (68.89)

Overall, the practice of cramming conducted by 1554 students (64.4%) who took the remedial exams which consisted of 505 males (32.51%) and 1049 female students (67.43% of all perpetrators of cramming). However, when compared with the total number in each group (male and female students) in the form of a ratio (cramming male: total male students and cramming female: total female students), the ratio of male students who are cramming is 0.68 and those who are women are slightly lower at 0.62.

Percentage of Passing the remedial exam in the cramming and non-cramming groups was both below 50%, it is just that the non-cramming group was slightly higher (44.88%) with an average score of 76.31 compared to the cramming group of 42.66% with an average score of 75.55. Our findings show that the cramming learning model does not make the learner understand the problem, instead it may just be rote memorization which the brain will not retain for a long period of time. Further research needs to be done to find out the details of

individual learning patterns when students conduct cramming.

Our data reveal that there are more male students conduct cramming (as many as 505 students of a total of 739 male students or 68.33%) than female students (as many as 1048 students of a total of 1675 female students or 62.56%) or in ratio 0.68 vs 0.62. Statistical analysis using Pearson Chi-square conducted in order to compare mean scores on each gender to identify any differences regarding cramming ($P=0.007$). The findings revealed that there is a difference between male and female students in the choice of cramming, where more male students do cramming.

The interesting phenomenon in the context of non-cramming students are as follows: (1) the percentage of female students who passed the exam (score > 65) was slightly higher than that of male students (46% vs 42.3%) and (2) in the group of female students who failed to reach the threshold score of 65 actually got a higher score on average than the group of male students (50.44 vs 48.05). This phenomenon is interesting to be explored more deeply in future research. We hypothesize that there is specific gender related internal factors, e.g., hormonal or psycho-emotional, that play a role in the choice of cramming.

To some extent, science often considered more acceptable to men than women, [18] even though no clear evidence of statistically significant differences found on previous scientific articles regarding cramming. Medical science in general tends to be considered a difficult subject by all learners, but men and women study it slightly differently, [19] including on how they organize their armamentarium, e.g., look for chances to make simple memory works, pointing crucial parts in their reading material, structure their method of study and even perhaps rewrite keywords so as to direct better understand the topic; or in other words try to use every sources they have efficiently. Women actually are better at multitasking than men [20].

Different genders showed a distinct finding in terms of risk-taking attitude [21,22]. Studies suggested that male and female adolescent respond differently to conditions that require them to take any risk [23,24]. Male adolescents were reported as being riskier as compared to female adolescents [23]. The risk-taking attitude among adolescents had exposed adolescent to

various negative implications such as cramming [1]. Further consideration of psychological and emotional characteristics regarding each gender, males are plausible to utilize more life threatening risk-taking activities as differentiated to their female counterparts and usually it works in certain conditions [25]. Actually, it is males with high risk-taking attitude were less socially anxious and less sensitive to the possible negative outcomes, e.g., failing the exam, compared to female adolescents [24]. And in our study, it seems that our findings support that previous statement. Male that conducted cramming were more successful than female students, as evidenced by a higher percentage of passing the remedial exam (M:F=40.19%:22.8%, $P=0.928$). although this statement does not mean that we encourage male students to be more active in cramming. Once again, the results of this cross-sectional study can be scientifically justified, but that does not necessarily mean that the result represent all medical students.

It seems that Male adolescent seemingly involved in risk-taking due to the nature of the attitude being socially acceptable; and the more it is done, the perpetrator will be more tolerant of risk as his brain rationalizes it [26]. On contrary, Women are perceived to be more risk averse; their feminine aura directs them to be more attentive in taking risks and have the tendency to avoid them, especially when they find the risks outweigh the benefits, or even would have adverse effects on themselves [27]. Actually, adolescents are vulnerable towards risky situations despite the mixed findings of risk-taking attitude in between genders [28]. specifically, more in-depth study need to be conducted to reveal any specific gender related factors associated with the act of cramming.

In case of Place of residence, the study result revealed that statistically, there is a significant difference between students who live in their own house conducted more cramming than students who live in the boarding houses ($P=0.000$). We assume that those who live in boarding houses alone by him/herself, away from home and parental supervision, are required to be more responsible and organized. It is possible for those with limited sources of financing, these mediocre students are forced to choose a boarding house with minimal facilities (for example, no Wi-Fi). Therefore, boarding house based students will tend to be required to be more creative, have a countable supporting network and have their own coping mechanisms

to make up for these deficiencies. Whether living in dormitory or boarding house, as long as students live alone apart from their families at home, this condition remains a challenge. Study conducted by Karnina [29] revealed there was no correlation between cumulative GPA in students living in both types on non-own house [29].

On the contrary, for those who live at home alone, it seems more tempting. Usually the house has facilities that add to the comfort of the occupants and make it easier for modern human activities which sometimes diverts the focus of attention (e.g., because it is so comfortable, student become lazy to study and continue to play online). Not to mention that it is possible the distance from their home to campus is very far so that the journey must be taken in a long time with various difficulties such as severe traffic jams, changing modes of transportation, etc., which can make students tired even before the lesson starts and this actually adds to the complexity of the problem.

It will be interesting to explore deeper into these things in more depth, especially in relation to

procrastination which ultimately leads to cramming. We can see further analysis of this previous statement on Fig. 1.

Further analysis of exam result/score conducted by grouping based on the gender which is then further divided by their place of residence. Out of the 80 non cramming male students living in boarding houses, 34 students (42.5%) got a score > 65 with an average score of 75,29; whereas of the 154 male students living in their own houses, 65 students (42.20%) got a score > 65 with an average score of 77.03. While in the sub group of cramming male students living in their own home (n=337) the result is as follows: only 39.76% pass the exam with lower mean score 75.47 (compared to the non-cramming male living in own house) whereas of the 168 male students living in boarding house, the percentage of passing the remedial exam is 41.07% with mean score 75.02. The percentage of failing the exam in the group of male students was slightly higher for those who did cramming, both living in boarding houses and their own homes, compared to students who prepared better and not conducting cramming.

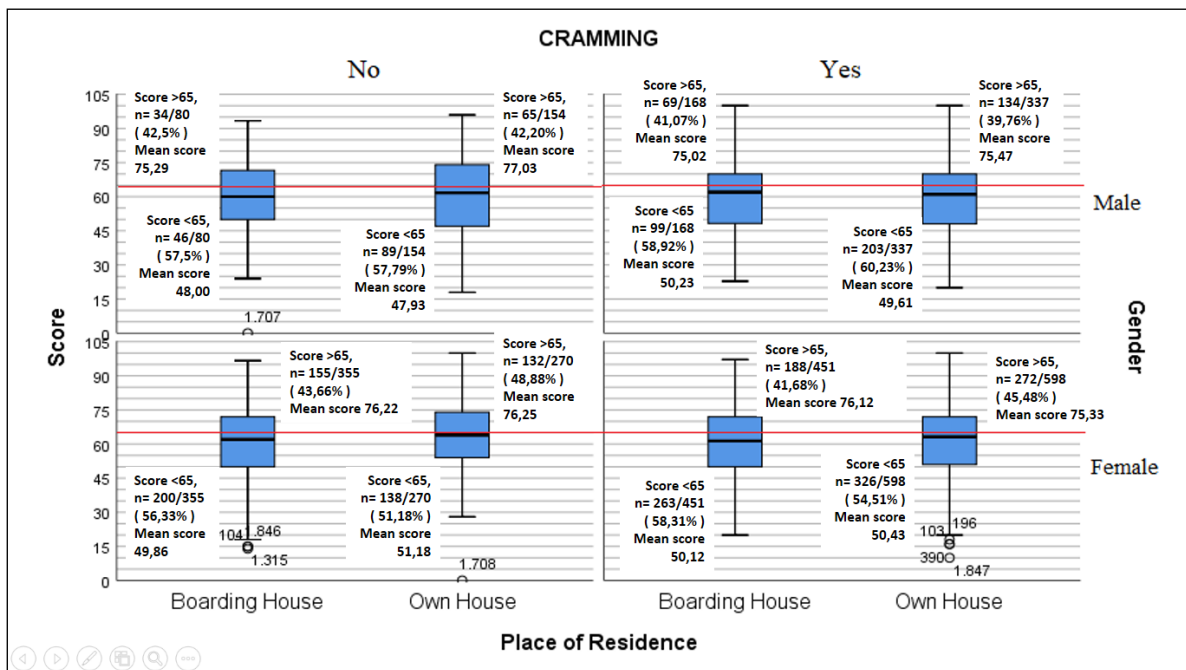


Fig. 1. Box plot diagram of Cramming perpetrator based on combination of gender and place of residence. Upper left quadrant: non-cramming male student, upper right quadrant: cramming male student, lower left quadrant: non-cramming female student, lower right quadrant: cramming female student. In all quadrant, the data is presented further by dividing into two categories of residence. The red line shows the lower threshold of the passing score, which is 65

The data on the non-cramming group of women are as follows: those who lived in the boarding houses as many as 355 (in total) and out of 355, it turns out that only 155 (43.66%) successfully pass the exam with mean score 76.22. While in the sub group of non-cramming female students living in their own home (n=270) the result is only 48.88% pass the exam with mean score 76.25. On the contrary, for those cramming female students that live in boarding house the percentage of passing the exam is only 41.68% and those who live in their own house only pass as much as 45.48% with mean score 75.33. The same phenomenon of failing the remedial exam also occurred in the group of female students; the percentage of those who fail is higher than those who pass.

Our findings show that cramming is not always negative in terms of the fact that the method can still make the perpetrator reach the pass threshold. Cramming itself as a learning entity still deserves to be reckoned with, at least for short-term success, although its overall effectiveness in the long term remains doubtful [1].

To our understanding, that cramming behavior is part of the search for identity-youth seek autonomy in adolescents who are in the middle of their growing up phase and their own effort for self-actualization [30]. We believe that cramming will not be practiced continuously. As the perpetrators get older and become more open minded, awareness regarding their self-esteem, in combination with common moral values regarding hard work and struggle, will arise, subconsciously [31]. This emotional maturity stage will make the practice cramming is no longer relevant to be practice in addressing daily life situation that requires maturity, planning and resilience [32]. By building step by step self-resilience through everyday experience and combining it with academic self-concept, it seems that significant college adjustment and achievement slowly develop the student's confidence.

To our knowledge, even though the practice of cramming is carried out in many places, scientific publications regarding this are still limited, especially electronically. There is a sort of academic taboo that stands in the way of exploring this practice. So it is quite difficult to compare our findings with references from elsewhere.

Further analysis regarding gender and place of residence among cramming perpetrator was

conducted based on the year level (1st, 2nd or 3rd year). It is interesting to further explore whether there are differences in the practice of cramming as students become more senior/higher in their level of education; the data analyzed is presented in the form of a trend line graph.

The data in Fig. 2 reveals a pattern of decreasing incidents of cramming in all variables (male-female and own house-boarding house) as the level of education increases. Among the first year students (male-female and living in own house-boarding house) the percentage of cramming were all above 65%, and slowly began to fall in sophomores, although the decline has not drastically seen compared to the percentage of third year students (in general less than 60%). It is very interesting to analyze this phenomenon furthermore.

Our assumption is that the prevalence of cramming which is still high among first-year students is because they have not been able to immediately adapt to the way of learning in university/higher education. Traditional methods and patterns of learning as practiced in high school are still carried away, not to mention the unpreparedness in adapting to academic and social life on campus. Social events such as music, sports, travelling or outbound activity is not carried out during academic hours, but it is usually carried out in the evenings after the last class finished or on weekend holidays. Also of course, such activities also drain energy and take up time that could actually be used for rest.

In addition, the limitations of effective learning deadlines that apply while campus social life is also being intensively targeting new students [1]. For the freshmen, the effort to be accepted in a new place as soon as possible is through active participation in social events on campus, especially those involving many seniors. These things become a series of events that trigger procrastination [33,34].

Regarding the trend line, based on the variables of gender and place of residence, the steepest downward trend occurred in the group of students living in boarding houses, where there was a decrease of 19.2%. Meanwhile, the sloping decline occurred in the group of students who stayed at their own home, which was only reduced 11.75%. When compared between gender variables, the reduction in cramming practices was greater in the male group (17.27%) than in the female group (16.49%).

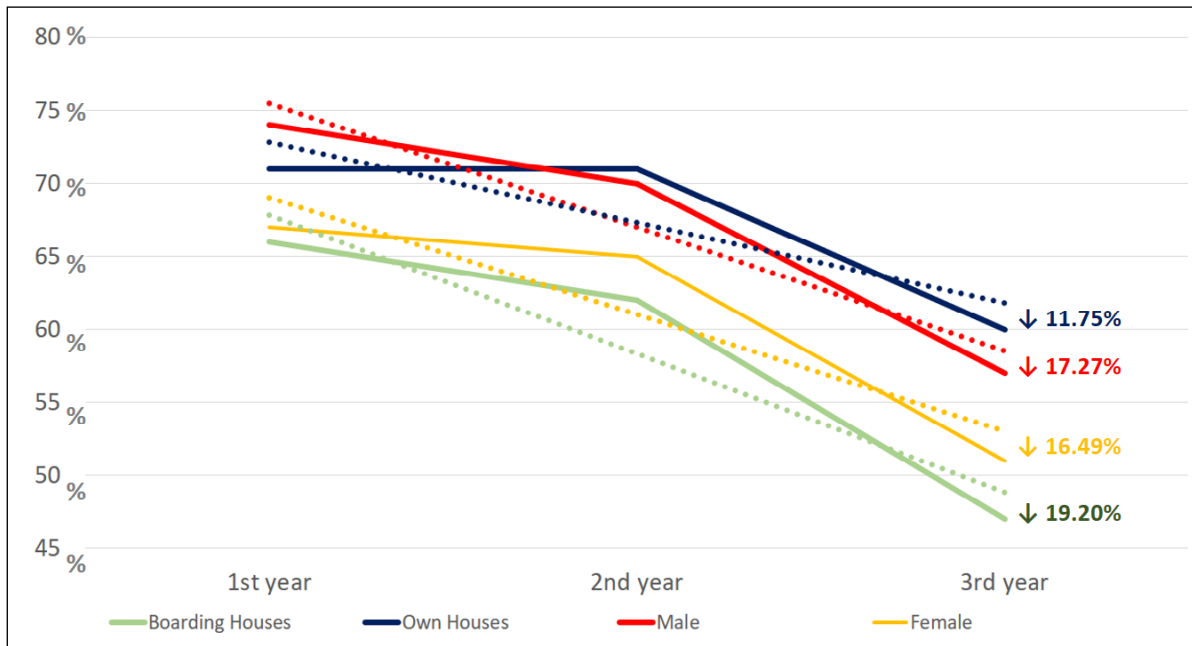


Fig. 2. Reduced trend of cramming as indicated by the decreasing percentage (among male-female and living in own house-boarding house) based on the year level (1st, 2nd and 3rd year students). Red line represents male students, yellow line represents female, green line represents those who lived in the boarding houses and blue line represent those who lived in their own house. The straight line connects the percentage of the number of cramming incidents in first-second-third year students, while the dotted line shows the decreasing trend line or pattern that occurs in all variables (gender and place of residence)

The trend line that shows this downward pattern indicates several things, namely:

- 1) Even though at the beginning of education the percentage of cramming is high, but over time the student's perspective is widely open. So as they become seniors, students' insights become more positive, and they seem to understand more about their duties and responsibilities;
- 2) Along with the learning model in medicine which actually is like an inverted pyramid, where the higher the level of education, the more complex the material being studied, so that the "cramming based" learning model is no longer relevant in sophisticated exams that integrates more subjects, e.g., involving Anatomy, Histology, Physiology, Pathology, Parasitology, Microbiology, Internal Medicine, Obstetrics and Gynecology etc. all at once, at the senior level and the decreasing practice of cramming when students reach higher levels of education justified point no. 2;
- 3) Or maybe the reason is as simple as the failure of cramming in the previous exams

so that it makes the perpetrator failed to pass a subject and followed by their internal conversion and no longer wants to conduct cramming in the next exams.

The reasons mentioned above are indeed very interesting, although they must be scientifically proven through further study. These data do not necessarily represent all of our students and/or even medical students elsewhere because it must be remembered that these are the results of all our remedial exams, which of course suggests that the students may not be the most outstanding academic achievements.

The participants that had already failed in the previous regular exam might feel they already know what type of the questions being tested will be like and then unfortunately they take them for granted and choose to conduct cramming. Although this satire allegation must be proven further through more in-depth study regarding personal motives that drive this irresponsible behavior.

The results of this study should open insights for all stake holder in the field of medical education,

and it must be clearly said that all of these findings do not necessarily represent all of our students, let alone students of medical faculties elsewhere.

4. CONCLUSION

The prevalence of cramming in this study was 64.35% and performed by both gender. As a percentage, slightly more male students do cramming than female students. Regarding place of residence, the percentage of cramming found more in the sub group of female students who lived in their own house. As students move up to their senior level, the practice of cramming is increasingly being abandoned. Further study need to be conducted regarding motives that drive the perpetrator to do cramming; whether it is an individual driven or related to external conditions or a combination of both.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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