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41

1 **ABSTRACT.**

2

3 **Background:** The impostor phenomenon (IP) is the tendency to attribute success to external factors rather  
4 than to one's abilities. It is frequent among students and has a negative impact on their wellbeing. This study  
5 aimed to assess the occurrence and mental health factors associated with IP in medical students.

6 **Methods:** Cross-sectional study of University of Khartoum Medical students (December 2021–January 2022),  
7 using convenience sampling. We collected the Clance Impostor Phenomenon Scale (CIPS), Patient Health  
8 Questionnaire-4 (PHQ-4: anxiety and depression), 2-item Maslach B burnout Inventory (MBI), and Single-Item  
9 Self-Esteem Scale (SISE). Data was analyzed using SPSS with correlation analyses, linear regression, and  
10 Chi-square tests.

11 **Results:** Among 409 medical students, the impostor phenomenon (IP) prevalence was 52.8% (216 students),  
12 with a mean CIPS score of  $63.37 \pm 17.02$ . IP was more common in females (71.8%) and students aged 19–21  
13 years (40.7%). Anxiety (41.6%), depression (48.7%), and burnout (39.6% emotional exhaustion; 26.9%  
14 depersonalization) were prevalent, with higher rates in females. Regression analysis showed significant  
15 predictors of IP, including burnout (+1.32 points per unit,  $p < 0.001$ ), perfectionism (+0.86 points per unit,  $p <$   
16  $0.001$ ), parental overprotection (+2.43 points per unit,  $p < 0.001$ ), and depression (+2.90 points,  $p = 0.024$ ),  
17 while self-esteem showed a negative association ( $-4.19$  points per unit,  $p < 0.001$ ). Gender differences were  
18 observed in three CIPS items, with stronger female endorsements.

19 **Conclusions:** IP is prevalent and linked to family dynamics, personality traits, and mental health issues.  
20 Efforts to increase awareness and facilitate IP management should be implemented.

21

22 **Keywords:** impost or, imposter, impostorism, depression, anxiety, burnout, self-esteem, Perfectionism, family  
23 dynamics.

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## 1 INTRODUCTION.

2

3 Clance and Imes first used the term "impostor phenomenon" (IP) in 1978 to describe an internal feeling of  
4 intellectual phoniness that appears to be more common and severe in many accomplished women.<sup>1</sup> Pauline  
5 Rose Clance, a pioneer in the impostor phenomenon research field, defined the impostor phenomenon in  
6 1985 as "an internal experience of intellectual phoniness that those who feel fraudulence and worthlessness  
7 in spite of outstanding academic or professional accomplishment have." <sup>2</sup> The women in Clance's study  
8 credited their achievements to outside influences like luck, misgrading, or the faulty judgment of professors.<sup>1</sup>

9

10 The impostor phenomenon, impostorism or imposter syndrome, has received increasing attention in the last  
11 two decades. Subsequent research described the presence of IP in the male population, in many professional  
12 settings, and among multiple ethnic and racial groups.<sup>3</sup>

13

14 IP prevalence ranged greatly from 9% to 82%, mostly depending on the screening method and cutoff points  
15 employed to evaluate impostor phenomenon symptoms.<sup>3</sup> Many of these studies were conducted in the USA.  
16 A recent study in Saudi Arabia found a prevalence of 57.8% in a sample of 384 young adults .<sup>4</sup> Another study  
17 in the medical students of Imo State University, Owerri, Nigeria, found that 54.5% of the medical students had  
18 a CIPS score of 40 or below, indicating a few characteristic features of IP.<sup>5</sup> Medical students are among those  
19 afflicted with IP. This can be attributed to the highly competitive and demanding nature of admission to  
20 medical schools and the competitive nature of medical schools themselves. This course of study could  
21 promote the emergence of unhealthy thought patterns, such as impostorism, maladaptive perfectionism, and  
22 connecting self-worth with academic achievement.<sup>6</sup> According to a study by Rosenthal et al., 87% of new  
23 students had high or extremely high IP.<sup>7</sup>

24

25 Some studies have associated IP with personality traits like self-esteem (which was found to negatively  
26 correlate with IP)<sup>5</sup> and Maladaptive perfectionism (which is considered a potential predisposing and  
27 sustaining factor of IP).<sup>8</sup> IP is also associated with psychiatric comorbidities such as depression, anxiety, and  
28 burnout.<sup>3</sup> It should be noted that the studies included are cross-sectional, and the direction of causality can't  
29 be deduced. The systematic review by Thomas and Bigatti pointed out that IP and perfectionism are among  
30 the most powerful predictors of psychological distress in medical students, with perfectionism also being a  
31 strong predictor of anxiety and depression.<sup>9</sup> Another factor involved with IP is family dynamics, such as  
32 maternal and paternal overprotection. which were linked with higher impostor scores.<sup>10</sup>

33

34 Medical students are at a high risk of developing Impostor Phenomenon (IP)<sup>7</sup>, which has been identified as a  
35 predictor of psychological distress in this population.<sup>9</sup> A recent study by Katherine S. Hu et al. revealed that  
36 31.9% of 169 medical students had "high" or "intense" IP scores. In comparison, only 3.5% and 12.2% of  
37 students had low to moderate scores, respectively. The study found that students with high/intense levels of  
38 IP were more likely to experience negative feelings of shame/embarrassment (22.2%) and inadequacy  
39 (29.6%), which were associated with higher levels of depression and anxiety.<sup>11</sup>

40

1 This study aims to increase awareness about IP and associated mental health factors among medical  
2 students worldwide. It also explores associated family dynamics and introduces a new regression model to  
3 help in identifying high risk medical students. This study is also a first of its kind in the Sudanese medical  
4 student's population and adds the growing body of literature in Sudan and the African region. therefore, the  
5 aim of this study was to identify the occurrence and factors associated with Impostor phenomenon among  
6 medical students at Khartoum University, Sudan, in 2021–2022.  
7

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## 1 METHODS

2

### 3 Study Design

4 This cross-sectional analytical study was conducted at the University of Khartoum, Faculty of Medicine, in  
5 Sudan. It included all students enrolled in the faculty at the time, comprising seven batches and a total  
6 population of 2,334 students. The study was carried out from December 23, 2021, to January 17, 2022.

7

### 8 Sampling Method

9 A non-probability convenience sampling method was employed. The proposed sample size was calculated<sup>12</sup>  
10 based on a prevalence of 50%, a confidence level of 95%, a 5% margin of error, and a population size of  
11 2,334 students. This resulted in a proposed sample of 330 participants, which was divided among the seven  
12 batches, with approximately 47 students selected from each batch. To account for potential non-responses,  
13 the sample size was increased by 20%, resulting in the collection of 409 responses.

14

### 15 Data Collection

16 Data was collected using a self-administered Google Form questionnaire, which was semi-structured, closed-  
17 ended, and pre-coded. The questionnaire consisted of three main sections. The first section captured the  
18 socio-demographic data of participants. The second section assessed the impostor phenomenon and its  
19 associated factors. The third section provided participants with links to articles and videos about the impostor  
20 phenomenon and its management to raise awareness about the condition.

21

### 22 Measurement Tools

23 We used the Clance impostor phenomenon scale (CIPS), a 20-item scale, self-reported measure, to assess  
24 IP. It has a range of 20 to 100 and was interpreted as follows: 40 or less = few impostor characteristics; 41 to  
25 60=moderate IP characteristics; 61 to 80 = frequently have impostor characteristics; and higher than 80  
26 =intense IP characteristics.<sup>13</sup> A cut point of 62 was used to differentiate between impostors and non-  
27 impostors.

28

29 We chose to measure self-esteem using the Single-Item Self-Esteem Scale (SISE), which has comparable  
30 predictive validity and strong convergent validity with the Rosenberg Self-Esteem Scale.<sup>14</sup> Participants answer  
31 the single item on a 5-point Likert scale.

32

33 Burnout was assessed using the two-item abbreviated Maslach B burnout Inventory (2-item MBI), which  
34 assesses two domains of burnout: emotional exhaustion (a state of emotional depletion at work) and  
35 depersonalization (a lack of feelings or negative and/or cynical feelings toward others). It's scored on a 0 to 6  
36 Likert scale and a score of >3 for either item indicated burnout. It correlated with the Maslach B burnout  
37 Inventory (MBI), with a sensitivity and specificity of 93.6% and 73.0%, respectively.<sup>15</sup>

38

39 The 4-item Patient Health Questionnaire-4 (PHQ-4) contained the 2-item depression scale (PHQ-2) and the 2-  
40 item anxiety scale (GAD-2). It was used to assess depression and anxiety over the past two weeks. The score  
41 for each subscale ranged from 0 to 6, while the total score ranged from 0 to 12. For the PHQ-2 and the GAD-

1 2, scores of  $\geq 3$  reflect depression or anxiety, respectively. The following categories correspond to the total  
2 PHQ-4 score: normal (0–2), mild (3–5), moderate (6–8), and severe (9–12).<sup>16-17</sup>

3  
4 Frost Multidimensional Perfectionism Scale-Brief (FMPS-B) was used to assess perfectionism. It has eight  
5 questions, divided into two subscales: evaluative concerns and strivings. The items were scored on a Likert  
6 scale from 1 to 5, for a minimum total score of 8 and a maximum of 40. Higher scores indicated stronger  
7 perfectionistic tendencies.<sup>18</sup>

8  
9 To minimize survey fatigue and maximize response rates, short yet validated scales, with the exception of the  
10 CIPS, were chosen for this study.

### 11 **Data Analysis**

12 The data was analyzed using SPSS version 26. Descriptive statistics, including mean, standard deviation,  
13 frequency, and percentage, were calculated to summarize socio-demographic characteristics and  
14 comorbidities. Bivariate analyses were conducted to explore associations between variables. Comparisons of  
15 the CIPS mean score with socio-demographic factors were performed using the Student's t-test and one-way  
16 ANOVA, with a significance level of  $p \leq 0.05$ . Correlations between the CIPS total score and associated factors  
17 were assessed using Spearman's rho and Pearson's r coefficients.

18  
19  
20 A multiple linear regression model was developed to predict impostor phenomenon, with the CIPS mean score  
21 as the dependent variable. The independent variables were selected using stepwise selection method. To avoid  
22 multicollinearity between the independent variables, multicollinearity diagnostics tools were used. Multiples  
23 models were produced and the best fit chosen based on the R-squared (0.550).. An item analysis of the Clance  
24 Impostor Phenomenon Scale was also conducted to evaluate its internal structure. Gender differences in  
25 individual CIPS items were analyzed using the Chi-square test.

26  
27 Ethical approval for the study was obtained from the Community Medicine Department at the University of  
28 Khartoum.. Informed consent was obtained from the students at the beginning of the Google form survey, and  
29 no information that could lead to student identification was collected.

30

## 1 RESULTS.

2  
3 The study included 409 students. Their socio-demographics are shown in **(Table 1)**. Using 62 as a cut point  
4 on the Clance impostor phenomenon scale (CIPS), the *occurrence* of the impostor phenomenon was found to  
5 be 52.8% (216). The mean CIPS score was 63.37 (SD = 17.02), with a range of 20 to 100. IP category  
6 distribution is shown in **(Table 1)**. Of the 216 participants who had IP, 155 (71.8%) were females and 61  
7 (28.2%) were males. Out of the 216 students with IP, 208 (96.3%) were single, 7 (3.2%) were married, and  
8 one (0.5%) was divorced. The age category between 19 and 21 had the highest occurrence of IP, 88 (40.7%).  
9 While the category between 25 and 30 had the lowest occurrence of IP with only 12 (5.6%) students.

10  
11 Anxiety and depression were measured using a 4-item PHQ scale; the mean of the total sample was  $5.4 \pm$   
12  $3.5$ , with a range of 0 to 12. The mean of the 2-item depression scale (PHQ-2) for the total sample was  $2.8 \pm$   
13  $1.9$ , with a range of 0 to 6. The prevalence of depression among the students was 48.7% (n = 199), and 142  
14 (71.4%) of those depressed were females. The 2-item anxiety scale (GAD-2) had a mean (SD) of  $2.6 \pm 1.9$ ,  
15 with a range of 0 to 6. Females also had a higher anxiety prevalence, 126 (74.1%).

16  
17 Burnout was assessed using a 2-item MBI scale; the total sample mean was  $5.5 \pm 3.5$ , the range (0–12). The  
18 burnout rate was higher in females: 124 (76.5%). For the emotional exhaustion item of the 2-item MBI scale,  
19 more than a third of the students had feelings of burnout from the study (39.6%, n = 162). The mean score for  
20 this item was  $3.2 \pm 1.9$ , with a range of 0 to 6. On the other item, depersonalization, about 26.9% of the  
21 students had feelings of depersonalization (n = 110) with a mean score of  $2.3 \pm 2$ , with a range of 0 to 6.  
22 Females also had a higher depersonalization rate, 79 (71.8%). The prevalence of these comorbidities is  
23 shown in **Table 1**.

24  
25 The mean of the single-item self-esteem scale for the whole group of students was  $2.3 \pm 1.1$ , with a range of 1  
26 to 5. To the statement: I have high self-esteem, 14.4% of the students described it as not very true of me (n =  
27 59), 19.1% responded as untrue of me (n = 78), 39.1% as neutral (n = 160), 18.3% as true of me (n = 75), and  
28 only 9% responded as very true of me (n = 37).

29  
30 Upon assessing perfectionism, the mean of the 8-item FMPS-B scale for the total sample was  $24.1 \pm 6.4$  (8 to  
31 40 range). The Evaluative Concerns for the Perfectionism domain had a mean (SD) of 11.08 (3.97). The  
32 striving for perfectionism domain had a mean (SD) of 13.06 (4.01). Females had a higher mean of 24.64 (SD  
33 = 6.51), compared to males mean of 23.02 (SD = 6.06), n = 401 (8 students didn't answer this question).

34  
35 The mean for parental overprotection turned out to be 3.26 (SD = 1.18), with a range of 1–5. The responses to  
36 the statement: my parents are overprotective were: 9.3% of the students responded strongly disagree (n =  
37 38), 15.6% disagreed (n = 64), 31.1% were neutral (n = 127), 27.6% agreed (n = 113), and 16.4% strongly  
38 agreed (n = 67).



1 We assessed family dynamics using a multiple-choice question where 220 students (53.8% of the total  
2 sample) mentioned at least one of the family dynamics, while the other 189 students (46.2%) provided “none  
3 of the above” as a response to this question. The family dynamics and their statistics are shown in **Figure 1**.

4  
5 This study found a statistical association between IP and gender ( $p = 0.028$ ) and academic year ( $p=0.008$ ).  
6 The other socio-demographic factors had no statistical association.

7  
8 Self-esteem, parental over-protection, anxiety, depression, burnout with its two items: emotional exhaustion  
9 and depersonalization, and perfectionism with its two subscales (strivings and evaluative concerns) all had a  
10 moderate to strong degree of correlation with the total CIPS score. (all with  $p<0.001$ ). As shown in **Table 2**.

11  
12 **Table 3** shows the multiple linear regression model. The model indicates a significant relationship between  
13 the linear combination of the predictors and the IP score,  $F(6,394)=80.3$ ,  $R^2 = 0.550$ ,  $p<0.001$ . Burnout scale  
14 score is a significant predictor, with each unit increase in burnout associated with a 1.32-point increase in the  
15 IP score ( $p<0.001$ ). Conversely, self-esteem shows a negative relationship with IP; for every unit increase in  
16 self-esteem, there is a 4.19-point decrease in the IP score ( $p<0.001$ ). Perfectionism is also a significant  
17 positive predictor, with each unit increase in perfectionism associated with a 0.86-point increase in the IP  
18 score ( $p<0.001$ ). Parental overprotection predicts a 2.43-point increase in the IP score for each unit increase  
19 in overprotection ( $p<0.001$ ). Students reporting pressure-based maternal relationships have an IP score that is  
20 3.49 points higher than their counterparts ( $p=0.028$ ). Additionally, students identified as depressed have a  
21 2.90-point higher IP score compared to those not identified as depressed ( $p=0.024$ ).

22  
23 When analyzing the correlation between the total CIPS score and the individual items of CIPS, we found that  
24 the scores on individual CIPS items have a moderate to high degree of correlation with the total CIPS score  
25 ( $p<.001$  for all items). The item analysis is attached in the **Supplementary Materials**.

26  
27 We then proceeded, Using the Chi-square test to compare males and females regarding individual CIPS  
28 items This revealed differences in the ratings of three items, 1, 14, and 18. Females endorsed all three items  
29 more strongly than males. There were no differences in the ratings of the remaining 17 items. As shown in  
30 **Figure 2**.

**DISCUSSION.**

This study investigated the occurrence and factors associated with the Impostor phenomenon among medical students of Khartoum University. Most of the study participants were females, 278 (68%). This is similar to Alrayyes S et al. study<sup>4</sup> and different from the study by J. N. Egwurugwu et al., where the majority were males.<sup>5</sup> The sample reflects the dominance of females in the study population of the University of Khartoum. The age range was between 17 and 30, which is in line with the study population of both Alrayyes S et al<sup>4</sup> and J. N. Egwurugwu et al.<sup>5</sup> Most of the participants were single, 397 (97.1%). Only 11 (2.7%) were married. Of these, ten were female. A low marriage rate of 12% was also reported by J. N. Egwurugwu et al.<sup>5</sup>

IP was found to be highly prevalent, with an occurrence of 52.8%. This is lower than Saudi Arabia's study prevalence (57.8%).<sup>4</sup> and is higher than the prevalence range reported by Thomas and Bigatti in their systemic review.<sup>9</sup> Our study participants exhibit high characteristics of IP. 223 (54.6%) of participants had CIPS score more than 61. This is in contrast to J. N. Egwurugwu et al., where participants showed lower characteristics of IP and higher levels of self-esteem.<sup>5</sup>

The study revealed that a majority of individuals experiencing IP were females, with a significant association between gender and impostor phenomenon ( $P$  value =0.023), a finding consistent with Alrayyes S et al. research. This finding supports the correlation between female gender and IP, but it does not make gender an independent predictor of IP. It is important to note that IP can also affect males, and all individuals of should feel encouraged to seek help. Age was not significantly associated with IP ( $P$  = 0.528). This lack of association may be due to the narrow age range of the participants in this study. Age effects should be addressed in a wider age range to see if IP characteristics dwindle or increase with time.

Regarding the academic year, the mean score for students in the middle years ( $66.2 \pm 15.9$ ) was significantly higher than the mean CIPS score for students in the first years ( $60.1 \pm 17.6$ ) ( $p$  =.008). Final-year students did not differ significantly from early and middle-year students. This suggests that impostor feelings are more frequent in the middle years of medical school. B. Levant et al. studied IP in third-year students as they transitioned from preclinical to clinical years, and these students had moderate to frequent impostor feelings.<sup>19</sup> In our study first year medical students had low IP feeling as opposed to a study by Rosenthal et al., where 87% of new students had high or extremely high IP.<sup>7</sup> this can be attributed to the students feeling highly confident after passing their high school exams. While later development of IP in subsequent years may be due to having lower confidence in the setting of peer pressure and demanding environment of the medical school.

Burnout rates have increased in recent years among both medical students and doctors.<sup>9</sup> Our study explored two items of burnout: emotional exhaustion and depersonalization (39.6% & 26.9%, respectively), and both items had a positive moderate correlation with CIPS score. These findings suggest that IP may contribute to burnout development. This is congruent with Alrayyes S et al.'s study.<sup>4</sup>

1 In our study, a high rate of anxiety and depression was reported (41.6% & 48.7% respectively). Both had a  
2 positive, moderate correlation with the CIPS score. Since this is a cross-sectional study, we cannot draw a  
3 conclusion about causality. It is unclear if these mental health problems increase the risk of developing IP  
4 characteristics, or if they are caused by IP.<sup>4</sup> Needless to say, whichever the case is, these mental health  
5 problems should not be ignored.

6  
7 The total score of FMPS-B had a strong positive correlation with the CIPS score. The subscale evaluative  
8 concerns also had a strong positive correlation with the CIPS score, while the strivings subscale had a low  
9 positive correlation. These findings serve to show that perfectionism can be used to predict IP. Similar findings  
10 were reported by Klug et al.<sup>8</sup>

11  
12 Self-esteem was the only factor with a negative correlation with IP. This is also reported in Nigerian medical  
13 students.<sup>5</sup> A study by K. Cokley et al. suggested a model where self-esteem mediates the link between  
14 perfectionism and IP.<sup>20</sup> This model and our study findings reflect a way to help prevent those with  
15 perfectionistic tendencies from developing IP by increasing their self-esteem.

16  
17 Another factor addressed in this study was parental overprotection. This was found to have a positive,  
18 moderate correlation with the CIPS score. Li, Hughes, and Thu reported this link as well.<sup>10</sup> From the start,  
19 family dynamics were included in Clance's study, in which she and Imes coined the term.<sup>1</sup> In our study, while  
20 many students reported a lack of communication in their families, it was the pressure-based maternal  
21 relationship that had a link with IP. This finding was also endorsed by Li, Hughes, and Thu<sup>10</sup> and explored in  
22 T. jeledan;s qualitative study.<sup>21</sup> In Sudan, mothers are commonly known to pressure their offspring to pursue  
23 academics and use peer pressure as means to motivate them.

24  
25 A regression model was generated to accommodate all the factors correlated with IP and the change in CIPS  
26 score with these factors. Pressure based maternal relationship predicted the highest increase in the CIPS  
27 score (3.49 units), and self-esteem predicted the highest decrease in CIPS score (-4.19 units). It's noted that  
28 while lack of communication was the predominant family dynamic reported by the students, it was the  
29 pressure based maternal relationship that had the highest predicting value. The other family dynamics didn't  
30 do well when testing the model. This model provides insight to identifying high risk students and also possible  
31 solutions to address IP. (Namely helping students increase their self-esteem and treating depression and  
32 burnout.)

33  
34 In this study, an item analysis was also done, and all individual CIPS items had a moderate to high degree of  
35 correlation with the total CIPS score. Item six: "I'm afraid people important to me may find out that I'm not as  
36 capable as they think I am." And item 13, "Sometimes I'm afraid others will discover how much knowledge or  
37 ability I really lack." Had the highest correlation with the CIPS score. item one, "unfounded fear of failure" had  
38 the lowest correlation with the CIPS score.

39  
40 Gender differences among the different CIPS items were studied, and it was found that the ratings of items 1,  
41 14, and 18 differed significantly. Women favored all three items more than did men. Item one reflects the

1 unfounded fear of failure; Item 14 is about the fear of failing at new assignments; and Item 18 shows  
2 unfounded worries about succeeding. These findings are different from those of Levant et al., in which items  
3 17 and 18 had a gender difference but were also more endorsed by females.<sup>19</sup> Item 17 is about comparing  
4 one's abilities to others. These items can be more endorsed by women because they feel they have more to  
5 prove than their male counterparts.

6  
7 Regarding the limitations of this study, it should be noted that as this is a cross-sectional study, the direction  
8 of causality can't be deduced. The relationship between impostor phenomenon and the factors explored in  
9 this study is one of association and not causation. This is especially evident with mental health comorbidities.  
10 We cannot determine if IP causes these comorbidities or if the comorbidities caused IP. It should also be  
11 noted, that the sampling method used was a convenient non-probability sampling, which may impact the  
12 generalizability of the study results to the population at large. This sampling method is known to cause  
13 selection bias as only the students who were available at the time could be included in the study. However, to  
14 strengthen the results, the sample size was increased from 330 to 409 participants.

15  
16 The questionnaire was self-administered, which can lead to social desirability bias, especially where mental  
17 health problems are regarded. We endeavored to reassure the students about their confidentiality and the  
18 anonymity of the questionnaire was stated in the beginning of the questionnaire. It is important to note that  
19 the tools used in the questionnaire to assess depression and anxiety, burnout and depersonalization,  
20 perfectionism, and self-esteem were all short screening tools, designed to avoid survey fatigue and not  
21 intended to reflect actual diagnoses of these factors. Additionally, since this study was conducted using a  
22 Google Form, only participants with internet access at the time were included.

23  
24 In conclusion, this study found that medical students at Khartoum University experience a high occurrence of  
25 IP, with gender, academic year, self-esteem, parental overprotection, anxiety, depression, burnout, and  
26 perfectionism all being associated with IP. The regression model included self-esteem and pressure-based  
27 maternal relationship, parental overprotection, depression, the emotional exhaustion item of burnout, and the  
28 perfectionism scale.

29  
30 Given the mental and psychological status of the students at the University of Khartoum, preventive measures  
31 are necessary. The regression model developed by this study can help identify high-risk individuals. Support  
32 groups can be started for students identified by the model, as IP can be very isolating. Mental health problems  
33 can be addressed in the university clinic. In addition to solving the associated comorbidities, efforts should be  
34 done to address the maladaptive ways of thinking associated with IP.

35  
36 Further studies should be conducted using probability sampling to insure the generalizability of the results. To  
37 explore causality, research designs other than cross sectional studies can be used. Wider age ranges should  
38 be explored in subsequent studies. Gender differences in IP can also be further studied. The effect of IP on  
39 medical students and how it impairs their development as doctors is an important avenue that should be  
40 explored in depth as it can affect future patient care.

## 1 **SUMMARY - ACCELERATING TRANSLATION**

2

### 3 **Am I A Fraud? Occurrence and Associated Factors with Impostor Phenomenon among Medical** 4 **Students of Khartoum University, 2022.**

#### 5 **Main problem:**

6 Impostor phenomenon, imposterism, commonly known as imposter syndrome, is a term used widely in the  
7 past few years. It is receiving increasing attention lately, and many people can relate to imposter syndrome.

8 The term was coined back in 1985 by Clance and Imes in the first study that described the impostor  
9 phenomenon in a sample of highly achieving females, which was defined as "an internal experience of  
10 intellectual phoniness that those who feel fraudulence and worthlessness despite outstanding academic or  
11 professional accomplishment have."

12 Since then, many studies have explored IP in both genders and among different occupations. The last few  
13 years specifically have seen a rise in the papers on the topic, most of which were in the USA.

14 Among the population studied were medical students and doctors. IP was reported by many as a feeling or a  
15 state accompanying the medical career. starting from the admissions, through the medical school itself, and  
16 passing on to residency. The feeling of not being enough or the feeling of fraudulence described by many in  
17 the field despite the evidence of the competency of these individuals has been a source of anxiety,  
18 depression, and burnout.

19 Addressing the impostor phenomenon and helping those in the medical field recognize it and manage it is  
20 bound to improve their mental health and general well-being, which is bound to reflect well on their patient  
21 care, which is the ultimate goal.

22

#### 23 **Aim of study:**

24 As such, this study was conducted to assess the occurrence of IP among the medical students of Khartoum  
25 University in Sudan in 2022. There are few papers on the topic in Africa and the Middle East region, and none  
26 in Sudan. This study aims to help fill this gap. This study intends to shed light on the risk factors that  
27 contribute to IP. It also seeks to investigate the mental implications of IP on medical students.

28

#### 29 **Methodology:**

30 This was a cross-sectional study conducted at the University of Khartoum, Faculty of Medicine, in Sudan,  
31 involving all the students enrolled in the faculty at the time (7 batches, 2334 students). Using convenience  
32 sampling, a sample of 409 students was chosen. The data was collected using a Google form. The data were  
33 then analyzed using SPSS software.

34

#### 35 **Results:**

36 **In** the study sample (409 students), impostor phenomenon was found in 216 students (52.8%). It is higher  
37 than the prevalence of a study conducted in Nigeria (54.5%).

38 The students had a moderate to high prevalence of depression, anxiety, and burnout. The impostor  
39 phenomenon was associated with gender. IP was more severe in middle-year students. We formed a model  
40 to help in predicting IP, and it had the following items: self-esteem, parental over protection, anxiety,  
41 depression, burnout, and perfectionism.

1  
2 **Conclusions:**  
3 The impostor phenomenon is frequent among medical students at the University of Khartoum and is  
4 associated with mental health problems, certain personality traits, and different family dynamics. Efforts to  
5 increase awareness and facilitate IP management should be implemented.

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3 **REFERENCES.**  
4

- 5 1. Clance PR, Imes SA. The imposter phenomenon in high achieving women: Dynamics and therapeutic  
6 intervention. *Psychotherapy (Chic)*. 1978;15(3):241.
- 7 2. Clance PR. *The impostor phenomenon: Overcoming the fear that haunts your success*. Atlanta:  
8 Peachtree Publishers; 1985.
- 9 3. Bravata DM, Watts SA, Keefer AL, Madhusudhan DK, Taylor KT, Clark DM, et al. Prevalence,  
10 predictors, and treatment of impostor syndrome: a systematic review. *J Gen Intern Med*.  
11 2020;35:1252-75.
- 12 4. Alrayeres S, Dar UF, Alrayeres M, Alghutayghit A, Alrayeres N. Burnout and imposter syndrome among  
13 Saudi young adults: The strings in the puppet show of psychological morbidity. *Saudi Med J*.  
14 2020;41(2):189.
- 15 5. Egwurugwu JN, Ugwuezumba PC, Ohamaeme MC, Dike EI, Eberendu I, Egwurugwu E, Ohamaeme  
16 R, Egwurugwu U. Relationship between self-esteem and impostor syndrome among undergraduate  
17 medical students in a Nigerian university. *Int J Brain Cogn Sci*. 2018;7(1):9-16.
- 18 6. Bruni F. *Where you go is not who you'll be: An antidote to the college admissions mania*. New York:  
19 Grand Central Publishing; 2015.
- 20 7. Rosenthal S, Schluskel Y, Yaden M, DeSantis J, Trayes K, Pohl C, et al. Persistent impostor  
21 phenomenon is associated with distress in medical students. *Fam Med*. 2021;53(2):118-22.
- 22 8. Pannhausen S, Klug K, Rohrmann S. Never good enough: The relation between the impostor  
23 phenomenon and multidimensional perfectionism. *Curr Psychol*. 2020;39(5):1412-7.
- 24 9. Thomas M, Bigatti S. Perfectionism, impostor phenomenon, and mental health in medicine: a literature  
25 review. *Int J Med Educ*. 2020;11:201-213.
- 26 10. Li S, Hughes JL, Thu SM. The links between parenting styles and impostor phenomenon. *Psi Chi J*  
27 *Psychol Res*. 2014;19(2):80-90.
- 28 11. Hu KS, Chibnall JT, Slavin SJ. Maladaptive perfectionism, impostorism, and cognitive distortions:  
29 Threats to the mental health of pre-clinical medical students. *Acad Psychiatry*. 2019;43(4):381-385.
- 30 12. Calculator.net. available from: <https://www.calculator.net/>. Last updated 2024. Cited November  
31 7<sup>th</sup>,2024.
- 32 13. Clance PR. *The Impostor Phenomenon: When Success Makes You Feel Like a Fake*. Toronto: Bantam  
33 Books; 1985. p. 20-22.
- 34 14. Robins RW, Hendin HM, Trzesniewski KH. Measuring global self-esteem: Construct validation of a  
35 single-item measure and the Rosenberg Self-Esteem Scale. *Pers Soc Psychol Bull*. 2001;27(2):151-  
36 161.
- 37 15. Li-Sauerwine S, Rebillot K, Melamed M, Addo N, Lin M. A 2-question summative score correlates with  
38 the Maslach Burnout Inventory. *West J Emerg Med*. 2020;21(3):610-615.
- 39 16. Löwe B, Wahl I, Rose M, Spitzer C, Glaesmer H, Wingenfeld K, Schneider A, Brähler E. A 4-item  
40 measure of depression and anxiety: validation and standardization of the Patient Health  
41 Questionnaire-4 (PHQ-4) in the general population. *J Affect Disord*. 2010;122(1-2):86-95.

- 1 17. Kroenke K, Spitzer RL, Williams JB, Löwe B. An ultra-brief screening scale for anxiety and  
 2 depression: the PHQ-4. *Psychosomatics*. 2009;50(6):613-621.
- 3 18. Woodfin V, Binder PE, Molde H. The psychometric properties of the frost multidimensional  
 4 perfectionism scale–brief. *Front Psychol*. 2020;11:1860.
- 5 19. Levant B, Villwock JA, Manzardo AM. Impostorism in third-year medical students: an item analysis  
 6 using the Clance impostor phenomenon scale. *Perspect Med Educ*. 2020;9:83-91.
- 7 20. Cokley K, Stone S, Krueger N, Bailey M, Garba R, Hurst A. Self-esteem as a mediator of the link  
 8 between perfectionism and the impostor phenomenon. *Pers Individ Dif*. 2018;135:292-297.
- 9 21. Jeledan TM. Prevalence of impostor phenomenon among Saudi female faculty and its roots during  
 10 their childhood: Qualitative approach. *Int J Humanit Soc Sci*. 2019;6(2):6-13.
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1 **FIGURES AND TABLES.**

2 **Table 1: Sociodemographic Factors and Impostor Phenomenon Comorbidities Among Students at**  
3 **the University of Khartoum Faculty of Medicine (n=409)**

Variable	Category	Frequency	%
<b>Age group</b>	18 and less	49	12
	19-21	164	40.3
	22-24	167	41.0
	25-30	27	6.6
<b>Gender</b>	female	278	68.0
	male	131	32.0
<b>marital status</b>	single	397	97.1
	married	11	2.7
	divorced	1	.2
<b>Academic year</b>	1 <sup>st</sup> year (A)	56	13.7
	1 <sup>st</sup> year (B)	57	13.9
	2 <sup>nd</sup> year	59	14.4
	3 <sup>rd</sup> year	56	13.7
	4 <sup>th</sup> year	59	14.4
	5 <sup>th</sup> year	62	15.2
<b>Impostor phenomenon</b> (62 as cut point on CIPS)	Yes	216	52.8
	No	193	47.2
<b>Impostor characteristics</b> (CIPS scores)	Intense(>80)	71	17.4
	Frequent (61-80)	152	37.2
	Moderate(41-60)	145	35.5
	Few (40 or less)	41	10
<b>Depression</b>	Yes	199	48.7
	No	210	51.3
<b>Anxiety</b>	Yes	170	41.6
	No	239	58.4
<b>Burnout</b> (Emotional exhaustion)	Yes	162	39.6
	No	247	60.4
<b>Burnout</b> (depersonalization)	Yes	110	26.9
	No	299	73.1

4

5

1 **Table 2: Correlations Between CIPS Scores and Self-Esteem, Anxiety, Depression, Burnout,**  
 2 **Perfectionism, and Parental Overprotection (n=409).**

<i>Factor</i>	<i>Total CIPS score</i>	
	<i>r coefficient</i>	<i>p-value</i>
<b>Self-esteem*</b>	-0.435 (M)	<.001
<b>Anxiety*</b>	0.356 (M)	<.001
<b>Depression*</b>	0.445 (M)	<.001
<b>Total burnout*</b>	0.499 (M)	<.001
<b>burnout from the study*</b>	0.492 (M)	<.001
<b>Depersonalization*</b>	0.380 (M)	<.001
<b>parental over protection*</b>	0.340 (M)	<.001
<b>total perfectionism**</b>	0.538 (S)	<.001
<b>evaluative concerns**</b>	0.641 (S)	<.001
<b>striving for perfectionism**</b>	0.226 (Sm)	<.001

\*using Spearman Rho coefficient

\*\*using Pearson r coefficient

M=Moderate correlation, S= Strong correlation, Sm= Small correlation.

3  
 4 **Legend:** All variables have moderate to strong correlations with the total CIPS score except for the striving  
 5 for perfection domain which has a small degree of correlation (r=.226), (p<.001 for all variables).  
 6

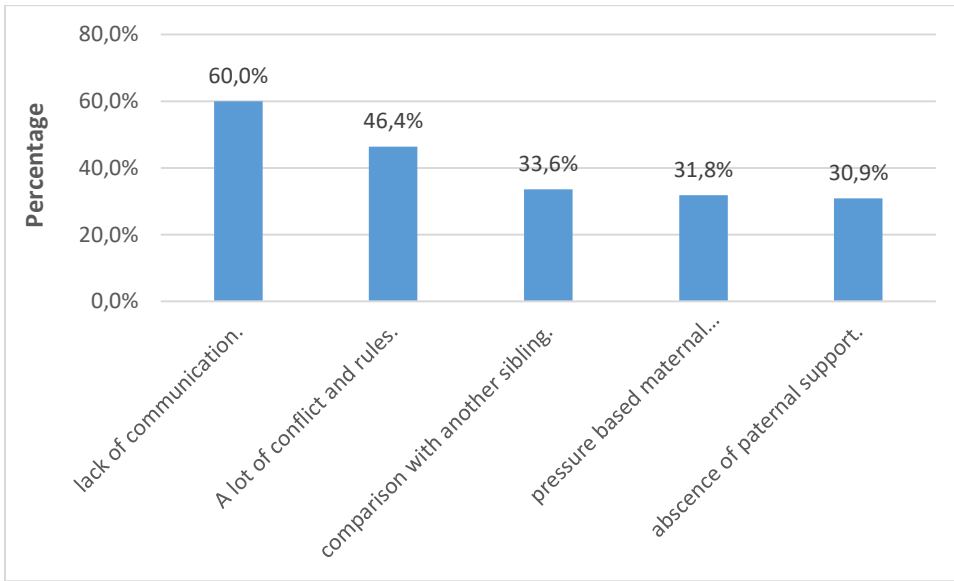
1 **Table 3: Predictors of Impostor Phenomenon Among University of Khartoum Faculty of Medicine**  
 2 **Students Using Multiple Linear Regression**

variables	Coefficients	p-value	95% Confidence Interval of the coefficients	
			Lower Bound	Upper Bound
<b>(Constant)</b>	37.424	<.001	31.414	43.434
<b>Burnout scale score</b>	1.323	<.001	0.944	1.703
<b>self-esteem</b>	-4.193	<.001	-5.221	-3.165
<b>perfectionism scale</b>	.856	<.001	0.660	1.052
<b>Parental overprotection</b>	2.429	<.001	1.418	3.441
<b>pressure-based maternal relationship</b>	3.496	.028	0.381	6.611
<b>Depressed or not</b>	2.902	.024	0.386	5.418

3  
 4 **Legend:** The linear combination of the measures was significantly related to the IP score,  $F(6, 394) = 80.3$ ,  
 5  $p < .001$ .

6

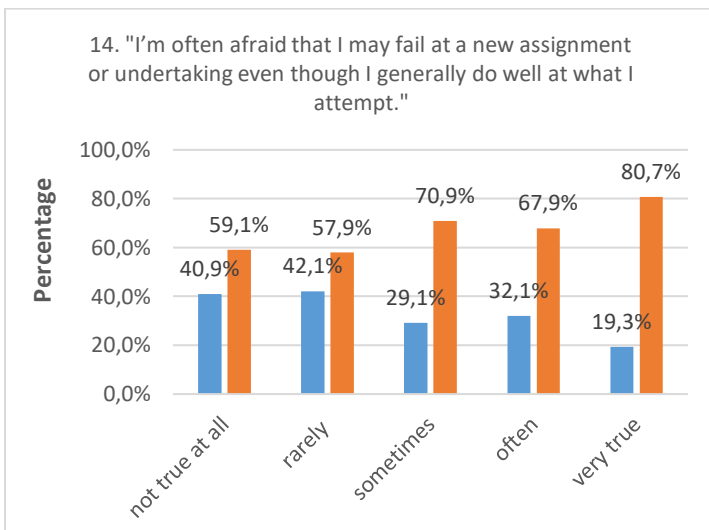
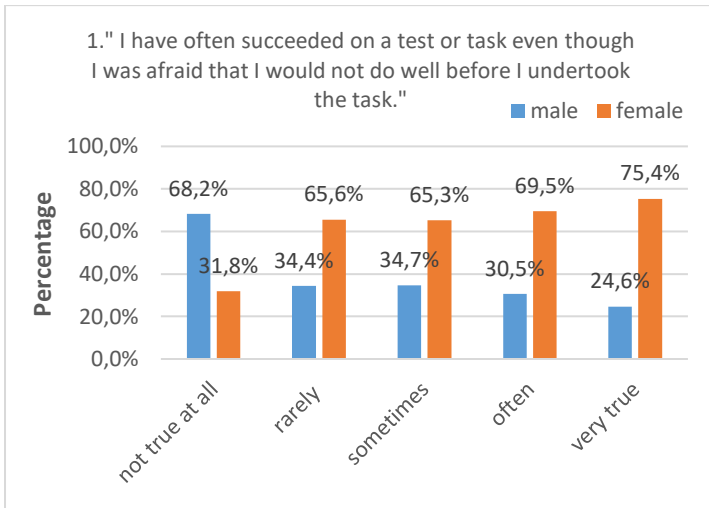
1 Figure 1. Responses to Family Dynamics Statement (Students Could Provide Up to 5 Responses), n= 220.



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1 **Figure 2.** Distribution of Responses by Gender to CIPS Items 1, 14, and 18 Using the Chi-Square Test.



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**Legend:** For item 1 ( $p=.002$ ), females mean score was  $3.9 \pm 1$ , males mean score was  $3.5 \pm 1.3$ . For item 14 ( $p=.014$ ), females mean score was  $3.2 \pm 1.4$ , males mean score was  $2.8 \pm 1.3$ . For item 18 ( $p=.002$ ), females mean score was  $3.6 \pm 1.3$ , males mean score was  $3.1 \pm 1.3$ .