Introduction
House officers experience extreme levels of stress during their training period. There is significant variation in level of stress among house officers of public sector hospitals to those of private hospitals because of the OPD input per day, excessive paper work and sample collection for lab investigations. None of the study has been done to find any variation in the stress level of house officers among different hospitals.

Objective
Objective of current study is to compare the stress levels among house officers working in Public and Private Hospitals of Karachi.

Method
A descriptive, cross-sectional study was conducted using a self-designed and self-explanatory questionnaire for identification of stress among house officers of government and private tertiary care hospitals of Karachi. Cronbach Alpha was calculated which was found to be 0.804. A multistage, non-probability sampling technique was used. The data gathered was analyzed with SPSS version 22. ANOVA with Post Hoc Tukey's test and a five-point Likert scale was used.

Results
The mean age of the participants in this study was 24 ± 1.2 years. About ¾ of the total sample was female, making it the majority. Variations was non-significant in positive attitudes in-between hospitals, but in negative attitudes, was highly significant (p=<0.001). To check for inter hospital variations, the post hoc Tukey's test was applied and significant variation was observed between Altamash Hospital (Private) and Civil (Public) (<0.001) and that of JPMC (Public) was also significant (p=0.027). Other than Altamash, the only other significant variation was...
observed for Civil (Public) and Baqai (Private) hospital with a p-value of 0.016. Weekly working hours played no significant role in positive attitudes in both sectors, while in negative attitudes it was significant in Public sector (p=0.008)

**Conclusion**

It can be concluded that house officers of Public sectors are suffering from high levels of stress, as compared to that of Private sector, but are more confident in making decisions at the workplace. It is important that concern authorities should take action to reduce working hours and emergency calls so that we can control chronic stress which is a risk factor towards depression.

**Keywords:** Stress; House officers; Sector; misdiagnosis.

**Introduction**

Mental health comprises of an individual's psychological, emotional and social well-being. It determines his/her ability to think and function. A threat to mental well-being includes the phenomenon of stress which can be defined as any emotional experience, causing discomfort, and which is accompanied by biochemical, physiological, and behavioral changes which cause bodily or mental tension (Sorenson, 2007; Christian, 2018). A stressor is the stimulus that induces stress (Sonnentag and Fritz, 2015). In the field of medicine, workplace stress is particularly commonplace. Approximately 28% of doctors, and other health care workers, have been perceived to have stress levels above the threshold. (Imran, Haider and Bhatti, 2011). Job stress has been linked inversely to quality working life and directly to hospital employees’ intentions of leaving their work (Mosadeghrad, Ferlie and Rosenberg, 2011). Common stressors in field of medicine include: long working hours, lack of adequate sleep and hence sleep deprivation, un-cooperative co-workers, problems with the family, and the fear of a patient’s expiry. (Maroof Hassan et al., 2014; Sadiq et al., 2018).

Several studies have suggested that the one-year training period after graduation is when house officers suffer enormous levels of stress. Karachi based study, in 2013, found that 47.9% of house officers were stressed, of whom 24.8% were male and 47.9% were female (Maroof Hassan et al., 2014). Such high levels of stress can lead to anger, cognitive impairment, cynicism and even family conflicts (Small, 1981). The common mistakes by house officers include: errors in making a diagnosis (33%), wrong drug prescribing (29%), inappropriate evaluation (21%), lack of proper communication (5%) and procedural complications (11%) (Wu et al., 2003). Inexperience and incomplete knowledge was reasons for error made in diagnosis and evaluation.

Several studies related to stress in house officers have been carried out but hospital to hospital variation specifically considering the public and private sector hospitals has not been taken into account. It is a well-known fact that in government hospitals, house officers have to do work like taking the patients for lab investigations, filing in the paper work and the OPD input per day is much greater than that of private hospitals. Excessive stress in the workplace can compromise the young doctors' ability to deliver effective patient care and hamper efficient learning (Shanafelt et al., 2002). Previously, a study has been conducted to find out different levels of stress on paramedical staff in government and private hospitals. Nurses working in a government hospital reported more stress compared to those in a private hospital (Tyson and Pongruengphant, 2004) but no study so far has looked particularly at house officers. Therefore, the aim of the current study is to compare the stress levels amongst the house officers who are working in Public and Private Hospitals of Karachi.
Methods

A descriptive cross-sectional study was conducted using a self-designed and self-explanatory questionnaire for identification of stress among house officers of government and private tertiary care hospitals of Karachi. Questionnaire includes questions related to demographics i.e. age, gender, ethnicity, year of study, lifestyle, weekly calls, weekly working hours, lifestyle changes due to stress. A pilot testing study with a sample of 20 house officers was used to validate the questionnaire. Cronbach Alpha was calculated which was found to be 0.804. The questionnaire was disseminated personally; names of students were not recorded. Sample Size was calculated using Openepi and was found to be 278 at 95% confidence interval.

Study was conducted in 6 months i.e. August 2018 to January 2019. Multistage non-probability sampling technique was used, in first stage 13 hospitals from both Public and Private sector (Jinnah Hospital, Civil Hospital, National institute of cardiovascular disease, PNS Shifa, Liaquat National Hospital, Patel Hospital, Fatima Jinnah Dental Hospital, Ziauddin Hospital, DOW Ojha Hospital, Baqai Hospital, Altamash Hospital, Aga Khan Hospital and Abbasi Shaheed Hospital) were selected, while in the second stage house officers from different departments were randomly selected for the study. All participants gave informed, verbal consent prior to taking part in this study. Ethical approval was taken by ethical review committee of Ziauddin University.

Statistical Package for Social Sciences (SPSS-22) was used for analyzing data. The mean with standard deviation were calculated for quantitative variables while frequencies and percentages were calculated for qualitative variables. For Likert scale, the values (0-5) were assigned to each option, starting from 0, meaning ‘never’ and up to 5, meaning ‘very frequently’. The association of stress with gender, working hours, weekly calls and duration of house job was calculated by using ANOVA. Furthermore, where applicable, the Post Hoc Tukey’s test was also used to analyze the intragroup variations.

Results/Analysis

About 340 questionnaires was given among house officers of different public and private hospitals of Karachi. 297 duly filled questionnaire were received, giving a response rate of 87.3%. Participants from thirteen different Public and Private sector hospitals of Karachi were included in the study. The mean age of the participants was 25 ± 1.2 years. The majority, about ¾ of the sample, was female, of which 84.6% reported their marital status to be single. 43% of the total participants reported working 96 hours weekly. Responding to a question about emergency calls, 65% said they were on call 7-9 times per month. On call time to sleep was also reported to be very low, that is, 1-2 hours per call. This is mentioned in Table 1.

Using a 5-point Likert scale, positive and negative changes in behavior were assessed. The scale had the following range of options: strongly disagree, disagree, neutral, agree and strongly agree. For the positive attitude scenarios, for male participants the mean score reported was 17.21+6.4, whereas that of female participants was reported to be 19.2+6.1. Likewise, negative attitude scenarios had a lower score reported by male participants (21.55+7.96), while female participants reported a higher score of 23.06+7.93. Variations between hospitals were non-significant in positive attitudes, but in negative attitudes, were highly significant (p=<0.001). Post hoc Tukey's test was used to check intra hospital variations and significant variation was observed between Altamash Hospital (Private) and Civil (Public) (<0.001) and that of JPMC (Public) was also significant (p=0.027). Other than Altamash, significant variation was reported for Civil (Public) and Baqai (Private) hospital with a p-value of 0.016. Working hours per week had no significant role in positive attitudes in both Public and Private sector hospitals, while in negative attitudes it was significant in Public sector (p=0.008) as well as in the overall results (p=0.002). Post Hoc Turkey’s test was used to infer the negative attitude which inferred that when the hours worked per week were increased, a
notable decline in behavior was observed. An increase from 42 to 96 hours resulted in a p-value of 0.01 and an increase from 60 to 96 hours resulted in a p-value of 0.038. House job duration also had a significant effect in the decline of positive attitudes and increased negative attitudes. Notable changes were observed in the final quarter of the house job for both positive (p=0.029) and negative (p=0.005) attitudes. Likewise, sleep deprivation experienced during shifts played an important role in positive attitudes (p=0.001) whereby a positive change of mean by 5.3 demonstrated improvement in positive attitudes. On the other hand, for negative attitudes, the perceived change was extremely noteworthy (p= 0.002), but with a further decline in negative behavior with a mean difference of -6.07. Significant increase was observed in positive attitudes, if the sleep time given was 5-6 hours (p= 0.001) but a worsening of negative attitudes was observed with 1-2 hours of sleep time. The main characteristics of study participants of both Public and Private sector were mentioned in Table 1.

**Table 1 Characteristics of Participants**

| Gender | Government Hospitals | Private Hospitals | Combined |
|--------|----------------------|-------------------|----------|
|        | N        | % | Positive Attitude (P Value) | N | % | Positive Attitude (P Value) | N | % | Positive Attitude (P Value) |
| Male   | 19 | 9.9 | 0.871 | 28 | 26.4 | 0.52 | 47 | 15.8 | 0.045 |
| Female | 172 | 90.1 | 0.797 | 78 | 73.6 | 0.238 | 250 | 84.2 | 0.231 |
|        | N | % | Negative Attitude (P Value) | N | % | Negative Attitude (P Value) | N | % | Negative Attitude (P Value) |
| Male   | 19 | 9.9 | 0.871 | 28 | 26.4 | 0.52 | 47 | 15.8 | 0.045 |
| Female | 172 | 90.1 | 0.797 | 78 | 73.6 | 0.238 | 250 | 84.2 | 0.231 |
| Marital Status | N | % | Positive Attitude (P Value) | N | % | Positive Attitude (P Value) | N | % | Positive Attitude (P Value) |
| Single | 164 | 85.9 | 0.430 | 88 | 83 | 0.009 | 252 | 84.8 | 0.025 |
| Married | 27 | 14.1 | 0.269 | 17 | 16 | 0.246 | 44 | 14.8 | 0.546 |
| Divorced | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0.3 |
| Working Duration | N | % | Positive Attitude (P Value) | N | % | Positive Attitude (P Value) | N | % | Positive Attitude (P Value) |
| 1-3 Months | 53 | 27.7 | 0.661 | 6 | 5.7 | 0.197 | 59 | 19.9 | 0.042 |
| 3-6 Months | 108 | 56.5 | 0.134 | 16 | 15.1 | 0.222 | 124 | 41.8 | 0.005 |
| 7-9 Months | 22 | 11.5 | 0.415 | 44 | 41.5 | 0.661 | 66 | 22.2 | 0.661 |
| 10-12 Months | 8 | 4.2 | 0.377 | 40 | 37.7 | 1.000 | 48 | 16.2 | 1.000 |
| Working Hours/ week | N | % | Positive Attitude (P Value) | N | % | Positive Attitude (P Value) | N | % | Positive Attitude (P Value) |
| 42 hours | 37 | 19.4 | 0.253 | 35 | 33 | 0.082 | 72 | 24.2 | 0.881 |
| 60 hours | 36 | 18.8 | 0.008 | 4 | 3.8 | 0.091 | 40 | 13.5 | 0.002 |
| 78 hours | 35 | 18.3 | 0.008 | 23 | 21.7 | 0.082 | 58 | 19.5 | 0.001 |
| 96 hours | 83 | 43.5 | 0.008 | 44 | 41.5 | 0.091 | 127 | 42.8 | 0.001 |
| On call/ month | N | % | Positive Attitude (P Value) | N | % | Positive Attitude (P Value) | N | % | Positive Attitude (P Value) |
| 1-3 | 19 | 10 | 0.578 | 26 | 24.5 | 0.152 | 45 | 15.2 | 0.421 |
| 4-6 | 44 | 23 | 0.907 | 17 | 16 | 0.109 | 61 | 20.5 | 0.228 |
| 7-9 | 128 | 67 | 0.005 | 63 | 59.4 | 0.010 | 191 | 64.3 | 0.003 |
| Sleep on call | N | % | Positive Attitude (P Value) | N | % | Positive Attitude (P Value) | N | % | Positive Attitude (P Value) |
| 1-2 hours | 102 | 53.4 | 0.593 | 42 | 39.6 | 0.005 | 144 | 48.5 | 0.001 |
| 3-4 hours | 85 | 44.5 | 0.766 | 46 | 43.4 | 0.010 | 131 | 44.1 | 0.003 |
| 5-6 hours | 4 | 2.1 | 0.182 | 18 | 17 | 0.005 | 22 | 7.4 | 0.001 |

The mistakes commonly observed by the house officers were categorized into five broad groups. Out of all the participants in the study, 28 of them (9.4%) reported no significant medical mistake, out of which 20 belonged to the government sector while 8 belonged to the private sector. Issues and mistakes resulting from knowledge deficit or incompetency, which led to wrong diagnosis of patients, was reported by 61 (20.5%) respondents. Of these 61 participants, 38 were from the public sector. 47 participants (15.8%) reported errors in patient’s evaluation,
including missing laboratory reports, vitals or inaccurate treatment modalities. 86 participants (29%) were found responsible for poor judgments (excluding errors due to knowledge deficit or incompetency) or poor decision-making (includes unattended patient, making a patient wait due to work overload or for lunch or talking).

The most frequent reason reported for errors was work overload (36.3%), making it the most likely underlying cause of mistakes. The second most important reason was inexperience, which led to wrong diagnosis or mishandling. Knowledge deficit, as well as substandard guidance or supervision from seniors, were some of the other important causes, as shown in Table 02. Another significant result observed in house officers was the fear of patient’s expiry, but this was found to decrease over time. Multiple strategies, mentioned in Table 2, were used by the house officers in order to cope with this fear. This led to passive acceptance for most, but with 12 participants (4%) out of the total still failed to cope with the fear of a patient expiry.

**Table 2 Mistakes, Causes of Mistakes and Coping Strategies**

| Cause of Mistakes                                                                 | Government (N) | Government (%) | Private (N) | Private (%) | Combined (n) | Combined (%) |
|----------------------------------------------------------------------------------|----------------|----------------|-------------|-------------|--------------|--------------|
| Error in diagnosis                                                               | 38             | 19.9           | 23          | 21.7        | 61           | 20.5         |
| Error in evaluation                                                              | 32             | 16.8           | 15          | 14.2        | 47           | 15.8         |
| Error in Prescription                                                            | 48             | 25.1           | 27          | 25.5        | 75           | 25.5         |
| Negligence                                                                       | 53             | 27.7           | 33          | 31.1        | 86           | 28.9         |
| No mistakes                                                                      | 20             | 10.5           | 8           | 7.5         | 28           | 9.4          |

### Causes of mistakes done by house officers

| Cause of Mistakes                                                                 | Government (N) | Government (%) | Private (N) | Private (%) | Combined (n) | Combined (%) |
|----------------------------------------------------------------------------------|----------------|----------------|-------------|-------------|--------------|--------------|
| Negligence                                                                       | 3              | 1.5            | 0           | 0           | 3            | 1.1          |
| Work Overload                                                                    | 70             | 36.6           | 31          | 29.2        | 101          | 36.6         |
| Work Environment                                                                 | 14             | 7.3            | 13          | 12.2        | 27           | 9.8          |
| Inexperience                                                                     | 37             | 19.3           | 25          | 23.5        | 62           | 22.5         |
| Lack of guidance                                                                 | 46             | 24             | 12          | 11.3        | 58           | 21           |
| Disease Complexity                                                               | 5              | 2.6            | 9           | 8.4         | 14           | 5.1          |
| Behaviour of colleagues                                                          | 12             | 6.2            | 3           | 2.8         | 15           | 5.4          |
| Attitude of attendant                                                            | 3              | 1.5            | 13          | 12.2        | 16           | 5.8          |

### Coping strategies adopted by house officers to overcome the fear of expiry

| Coping Strategy                                                                 | Government (N) | Government (%) | Private (N) | Private (%) | Combined (n) | Combined (%) |
|----------------------------------------------------------------------------------|----------------|----------------|-------------|-------------|--------------|--------------|
| Rationalized/ accepted                                                          | 44             | 23             | 25          | 23.6        | 69           | 23.2         |
| Supported patient                                                                | 26             | 13.6           | 12          | 11.3        | 38           | 12.8         |
| Talked to others for support                                                     | 52             | 27.2           | 20          | 18.9        | 72           | 24.2         |
| Avoid                                                                            | 10             | 5.2            | 7           | 6.6         | 17           | 5.7          |
| Optimistic faith                                                                 | 18             | 9.4            | 19          | 17.9        | 37           | 12.5         |
| Deny responsibility                                                              | 2              | 1              | 0           | 0           | 2            | 0.7          |
| Expressed emotion                                                                | 35             | 18.3           | 15          | 14.2        | 50           | 16.8         |
| Failed to cope                                                                  | 4              | 2.1            | 8           | 7.5         | 12           | 4            |

Few questions about lifestyle were asked with two options same as usual or more than usual in order to analyze the quality of life and effect of stress in their life. Increased capability of decision and facing problems were two positive qualities observed as a result of stress while loss of sleep, constant strain and feeling of sadness and depression was observed as negative effects of stress. The main lifestyle changes are explained in table 3.
Table 3 Effect of stress on lifestyle

|                          | Government |                      | Private |                      | Combined |                      |
|--------------------------|------------|-----------------------|---------|-----------------------|----------|-----------------------|
|                          | Same as    | More than usual       | Same as | More than usual       | Same as  | More than usual       |
|                          | Usual      |                       | Usual   |                       | Usual    |                       |
| N                        | %          | N                     | %       | N                     | %        | N                     | %       |
| Been able to concentrate | 115        | 60.2                  | 76      | 39.8                  | 56       | 52.8                  | 50      | 47.2                  | 171      | 57.6                  | 126      | 42.6                  |
| Lost much sleep over worry| 84         | 44                    | 107     | 56                    | 47       | 44.3                  | 59      | 55.7                  | 131      | 44.1                  | 166      | 55.9                  |
| Felt that you were playing a useful part in things | 81 | 42.4 | 110 | 57.6 | 44 | 41.5 | 62 | 58.5 | 124 | 42.1 | 172 | 57.9 |
| Felt capable of making decisions | 57 | 29.8 | 134 | 70.2 | 42 | 39.6 | 64 | 60.4 | 99 | 33.3 | 198 | 66.7 |
| Felt constantly under strain | 81 | 42.4 | 110 | 57.6 | 47 | 44.3 | 59 | 55.7 | 128 | 43.1 | 169 | 56.9 |
| Felt you could not overcome difficulties | 133 | 69.6 | 58 | 30.4 | 78 | 73.6 | 28 | 26.4 | 211 | 71 | 86 | 29 |
| Been able to enjoy normal activities | 134 | 70.2 | 57 | 29.8 | 57 | 53.8 | 49 | 46.2 | 191 | 64.3 | 106 | 35.7 |
| Been able to face up to problems | 72 | 37.7 | 119 | 62.3 | 41 | 38.7 | 65 | 61.3 | 113 | 38 | 184 | 62 |
| Been feeling unhappy and depressed | 96 | 50.3 | 95 | 49.7 | 74 | 69.8 | 32 | 30.2 | 170 | 57.2 | 127 | 42.8 |
| Been losing confidence | 145 | 75.9 | 46 | 24.1 | 87 | 82.1 | 19 | 17.9 | 232 | 78.1 | 65 | 21.9 |
| Been thinking of yourself as worthless | 144 | 75.4 | 47 | 24.6 | 80 | 75.5 | 26 | 24.5 | 225 | 75.8 | 72 | 24.2 |

Discussion

Stress has a higher prevalence in government hospital house officers than private hospital house officers. Furthermore, the mean score for stressors causing negative attitudes in government house officers are more than that of private sector. Further effects of these stressors seem to be that government house officers are unhappier, yet are confident in decision making at the workplace. In contrast, private house officers are happier, yet are less confident in decision making in the workplace.

A study on senior house officers pointed out that 51 percent of senior house officers were considered to be in psychological distress due to their occupation (McPherson et al., 2003). This reinforces the fact that there are high levels of stress amongst house officer. Another study on junior house officers claimed that 50% of them were considered stress, and 28% of subjects were considered depressed (Firth-Cozens, 1987). This example highlights the risk of stress leading to depression (Azodo and Ezeja, 2013). Literature review revealed that articles do not focus on specific differences of stress among house officers of public and private hospitals while one of the study suggests that paramedical staff like nurses who work in private setups are highly satisfied with their work environment (Chien and Yick, 2016). This may infer that the satisfaction in private hospitals are higher than government hospitals on an overall scale. It is important to point out that even though many participants in current study were dental students we can infer the high levels of stress in government institutions across the globe seem to be similar. Another article specific to government hospitals in Pakistan stated that 47.9% percent of house officers seem to be under high levels of stress (Hassan et al., 2014).

Our study highlights that government house officers are less happy, yet more confident in decision making, whereas private house officers are happier, yet less confident in decision making. In terms of confidence, a study by William et al states that that individuals with high levels of psychological distress often tend to have low levels of confidence.
(Williams et al., 1997). However, current study negates this finding because stress levels tend to be higher in public hospitals, yet house officers are much more confident in decision making than private house officers. A reason for this could be the point raised by Krautheim et al that confidence is likely to come through experience based intuition (Krautheim et al., 2017) and the current results suggest that government house officers have higher workloads than private house officers. It is also a known fact that government hospitals have a higher flow of patients which gives them more experience. On the other hand, private house officers claim to have less experience than government house officers which explains the lack of confidence. Therefore, these could be reasons why government house officers are more confident than private house officers.

Kalmbach et al reported that poorly sleeping physician trainees are at an increased risk of depression (Kalmbach et al., 2017). In another study a group of house officers and post graduate trainees were surveyed on sleep deprivation. In the study 78.84% of participants were considered sleep deprived, and 30% of participants were considered depressed (Mustahsan et al., 2013). These figures are important because in current study, 53.4% of government house officers state that they obtain 1-2 hours of sleep on call while only 39.6% of private house officers seem to get 1-2 hours of sleep. Overall, sleep on call plays a significant role in negative attitudes. Since private house officers seem to get more sleep than government house officer, there tends to be a greater sense of happiness amongst private house officers. After comparison we can state that both hospital setups have high stress, but government house officers have higher levels of stress. Actions can be taken to improve both hospital setups. It is important to understand that we cannot control acute stress, rather we must control chronic stress (Yang et al., 2015).

**Conclusion**

It can be concluded that house officers of Public sectors are suffering from high levels of stress, as compared to that of Private sector, but are more confident in making decisions at the workplace. It is important that concern authorities should take action to reduce working hours and emergency calls so that we can control chronic stress which is a risk factor towards depression.

**Take Home Messages**

- It can be concluded that the house officers of Public sectors are suffering from high levels of stress leading to depression, as compared to that of Private sector.
- Government Sector doctors are more confident in making decisions at the workplace.
- It is important to facilitate doctors and the concern authorities should take action to reduce working hours and emergency calls so that we can control chronic stress which is a risk factor towards depression.

**Notes On Contributors**

Muhammad Fazal Hussain Qureshi: Conceptualized and designed this study, both the intervention described and the rigorous measurement and analysis; spearheaded the acquisition of data and helped in the analysis and interpretation of the collected data; revised the drafted article critically for important intellectual content; provided final approval of the version to be published. I am currently a third year Medical Student doing MBBS from Ziauddin University.

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Mahira Lakhani: Conceptualized and designed this study, both the intervention described and the rigorous measurement and analysis; spearheaded the acquisition of data and helped in the analysis and interpretation of the collected data; revised the drafted article critically for important intellectual content; provided final approval of the version to be published. She is currently a third year Medical Student doing MBBS from Ziauddin University.

Muzna Shah: Conceptualized and designed this study, both the intervention described and the rigorous measurement and analysis; spearheaded the acquisition of data and helped in the analysis and interpretation of the collected data; revised the drafted article critically for important intellectual content; provided final approval of the version to be published. She is currently a third year Medical Student doing MBBS from Ziauddin University.

Nuzhat Tariq: Conceptualized and designed this study, both the intervention described and the rigorous measurement and analysis; spearheaded the acquisition of data and helped in the analysis and interpretation of the collected data; revised the drafted article critically for important intellectual content; provided final approval of the version to be published. She is currently a third year Student doing bachelor's in Social Sciences from Institute of Business Administration (IBA).

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Appendices

None.

Declarations

*The author has declared that there are no conflicts of interest.*

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