The Effect of Occupational Stress on Depression and Insomnia: a Cross-sectional Study Among Employees in a Ghanaian Telecommunication Company

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Abstract

Background Depression and insomnia are major psychiatric conditions that are predicted by occupational stress. However, the influence of occupational stress on these two conditions is under-explored in telecommunication companies, especially in Africa. This research was conducted to assess occupational stress in a Ghanaian telecommunication company and its effect on depression and insomnia.

Methods An analytical cross-sectional study was conducted among employees at a telecommunication company in Accra. Structured self-administered questionnaires were used in collecting data from 235 respondents using simple random sampling. Chi-square test of independence and the Wilcoxon Rank-Sum test were employed to assess the significance of associations with subsequent sensitivity analysis using Multiple logistic, Poisson and Probit regression models. Occupational stress was matched on three variables: age of the workers, responsibility for dependents and work experience, to improve on the estimation of its impact on symptomatic depression and insomnia using the coarsened exact matching procedure.

Results More males (52.8%) than females participated in this study. The age range for study participants was 20-49 years with a mean of 30.8 ± 6.9 years. The prevalence of occupational stress among the employees was 32.8% (95% CI= 26.7-38.8). More than half of respondents (51%) reported depressive symptoms in the past week and only a few (6%) reported being diagnosed with insomnia in the past year. Age, responsibility for dependents and work experience were the only background characteristics that were significantly associated with perceived occupational stress. After controlling for background characteristics, the estimated risk of reporting symptoms of depression among employees who perceived stress from work was only 5% higher [ARR; 95% CI=1.05 (0.94-1.17)] whereas it was 2.58 times the risk of reporting insomnia [ARR; 95% CI=2.58(0.83-8.00)] compared to those who did not perceive stress from their jobs. The relative risk reduced to 2.46[ARR; 95% CI=2.46(0.77-7.87)] and 1.03[ARR; 95% CI=1.03(0.91-1.17)] for insomnia and depression respectively after employing Poisson regression with CEM.

Conclusion The study found a higher risk of insomnia among employees who reported occupational
stress compared to those who did not. However, there was not enough statistical evidence to conclude that occupational stress was associated with depression among the study participants.

Background
There are variations in how individuals express vulnerability to stress based on modifications in neural mechanisms fashioned to properly tune and terminate stress responses (1). Coping strategies adopted toward stress are also just as much different due to individual characteristics. These characteristics including age, gross monthly salary, work experience, educational qualification, marital status, and gender have been reported as contributing to differences in the level of occupational stress (2–4).

Occupational stress resulting from exposure to workplace psychosocial hazards that produce strain can affect an employee’s mental and physical health. Depression, the leading cause of disability and the main indication of psychiatric conditions, as well as insomnia, are major psychological disorders reported to be significantly associated with occupational stress (5–7). High levels of perceived occupational stress do not only predict insomnia but also its recurrence (8). Fatigue after work and high levels of work rumination mediate this relationship between occupational stress and insomnia (9). Moreover, occupational stress has been implicated in the early onset of insomnia, that is before thirty years of age (10).

Workload is known to be a major stressor in the fast-growing and contemporary service industry globally and the telecommunication companies (telcos) are no exceptions (11). Moreover, a number of suicides informed by occupational stress in some telcos (12) indicate its influence on the psychological wellbeing of employees. Despite this, there is very little information on the extent of stress workload exerts on the workforce in telcos and also its psychosocial consequences on the individual workers in Africa. This study, therefore, aims to assess occupational stress in a Ghanaian telco and quantify its possible impact on two psychiatric conditions, depression and insomnia among the workers. The findings are intended to serve as evidence for employers to assess psychosocial hazards at their workplaces and effectively manage them so as to protect workforce health with the ultimate goal of improving productivity.
**Methods**

**Selection and description of participants**

Ethical approval (GHS-ERC Number: 046/01/18) was obtained from the Ghana Health Service Ethical Review Committee of the Research and Development Division, Accra, before conducting this analytical cross-sectional study. The study population comprised of employees, both permanent and contract staff, working at the Head Office of a Ghanaian telco in Accra. Study participants were selected by simple random sampling proportionate to the size of their departments. By this, all employees in this organization had equal opportunities to be part of the study and the diversity in their job descriptions were also catered for.

**Data collection tool and technique**

Data were collected on the variables of interest using a structured self-administered questionnaire constructed in English and adapted from the National Institute for Occupational Safety and Health (NIOSH) Generic Job Stress Questionnaire (GJSQ) (13). This tool has shown high validity and reliability: (0.65–0.90) (14) and (0.68–0.95) (15,16). The questionnaire was divided into three sections; the first section gathered data on respondents’ sociodemographic and job characteristics. Occupational stress was measured using a composite scale under four domains of workplace psychosocial stressors in section two: quantitative workload (4 items; 5-point Likert scale), responsibility for others (4 items; 5-point Likert scale), role conflict (4 items; 7-point Likert scale) and role ambiguity (5 items; 7-point Likert scale). In section three, the Center for Epidemiologic Studies Depression Scale (CES-D) as employed in the GJSQ was used to measure depression (reported symptoms of depression for the past 1 week) using a composite scale (14 items; 4-point Likert scale) whereas insomnia (reported clinical diagnosis of insomnia in the past 1 year) was measured using a single item with a binary response (1 = Yes, 0 = No). Also, two items in this section obtained respondent information on two lifestyle patterns: smoking and alcohol intake. Scoring keys provided by NIOSH Generic Job Stress Questionnaire were used to convert responses into quantitative measurements for analysis. The maximum period of time estimated for filling out a questionnaire was 10 minutes. Data collection was carried out for 5 weeks concurrently with data entry and cleaning.

**Statistical analysis**


Respondents’ data from completed questionnaires were entered manually into an excel form (Excel version 2016). A coding frame containing the scores corresponding to the responses on the questionnaires served as a guide for data entry to aid ‘translate’ the survey data into a workable dataset.

Descriptive (mean, median) and inferential statistics (hypothesis testing) were obtained from data gathered using the STATA version 15 software. The various ranges of scores for composite variables were as follows: workload and responsibility for others (0–16); role ambiguity (0–30); role conflict (0–24); overall occupational stress (0–86); depression (0–42) and work productivity (0–60). Higher scores implied higher perceived occupational stress and depression respectively. Total scores for each composite variable were converted into percentages before categorizing them. Overall occupational stress and the stress from the four psychosocial stressors were first categorized into a five-level ordinal scale: normal (0—33); mild (33.1—43); moderate (43.1—60); severe (60.1—79) and very severe (≥ 80) according to the Depression, Anxiety and Stress Scale (DASS).(17) Overall occupational stress was re-categorized into two levels: no stress and stress using the median as a cut off. Depression was also re-categorized into two levels: no depression (normal:0—15) and depressed (mild:15.1—33; moderate:33.1—52; major:52.1—70; and severe depression: ≥ 70.1) based on initial categorization adopted from a previous paper (18). The Skewness/Kurtosis test for normality was conducted to assess the distributions of each composite variable before categorization. The Chi-square test of independence and the Kruskal Wallis test were employed to assess the significance of associations with subsequent sensitivity analysis using Multiple logistic, Poisson and Probit regression models. To estimate sample average treatment effect (occupational stress) on the treated (respondents who perceived occupational stress), this study employed Coarsened Exact Matching (CEM) to improve on the estimation of the causal effect of occupation stress on depression and insomnia by reducing the imbalance in covariates between treated and control (respondents who did not perceive occupational stress) groups. The advantages of using CEM instead of other matching procedures have been well documented (19–21). The L1 statistic that measures overall covariate imbalance between workers with stress and those with no stress before and after matching were
estimated. The results from the Chi-square test of independence showed an only statistical significant relationship between occupational stress and age of the workers, responsibility for dependents as well as work experience hence the CEM procedure was restricted to only these three variables. However, to improve the precision of our impact estimate and to adjust for the remaining imbalance with other covariates, a Poisson regression model with robust standard error was used to adjust for these other covariates.

**Results**

A total of 235 respondents provided complete data in their self-administered questionnaires (96% response rate) and their demographic characteristics are presented in Table 1. The mean age for the sample was 30.84 ± 6.9 years with 53.6% of respondents within the age range of 20–29 years. More males (52.8%) than females participated in this study just as there were more singles (61.3%) than married. Respondents who reported to have at least one dependent at home (40.9%) were fewer than those who had no dependents. For job characteristics, more respondents (59.6%) were permanent employees and 51.9% worked overtime (more than 40 hours per week) for an average of 5.24 ± 7.1 hours per week. Employees who had worked for a maximum of 5 years were 86.8%.

All four psychosocial stressors: workload (97.9%), responsibility for others (50.6%), role ambiguity (34.5%) and role conflict (17.0%) were reported by respondents. The prevalence of overall occupational stress at this telco was 32.8% (95% CI = 26.7–38.8). The proportions of respondents who reported occupational stress by background characteristics are displayed in Table 1. More employees who reported stress from their jobs were in the 20–29 years’ category (64.9%) and more males (58.4%) than females also reported the same. Perceived occupational stress was higher among singles (70.1%), respondents without dependents (70.1%), and respondents on permanent employment (52.0%). Fifty percent of respondents who reported occupational stress had worked for at least one year in their current role. The Chi-square test of independence revealed that occupational stress was only significantly associated with age, responsibility for dependents at home and work experience.

*Table 1*
Distribution of occupational stress by background characteristics

**Characteristics**

**Occupational stress levels n (%)**

|               | No Stress (158) | Stress (77) |
|---------------|-----------------|-------------|
| **Age groups**|                 |             |
| 20–29 years   | 126 (53.62)     | 32 (22.47)  |
| 30–39 years   | 74 (31.49)      | 35 (25.33)  |
| 40–49 years   | 35 (14.89)      | 30 (20.79)  |
| **Mean age ±SD** |          |             |
| 76 (48.10)    |                 |             |
| 53 (33.54)    |                 |             |
| 29 (18.35)    |                 |             |
| 50 (64.94)    |                 |             |
| 21 (27.27)    |                 |             |
| 6 (7.79)      |                 |             |

χ² value, p

|               | No Stress (158) | Stress (77) |
|---------------|-----------------|-------------|
| **Sex**       |                 |             |
| Males         | 79 (50.00)      |             |
| Females       |                 |             |

7.26, 0.027

30.84 ±6.9
| Marital status | No | Yes |
|----------------|----|-----|
| Married        | 68 (43.04) | 54 (70.13) |
| Single         | 90 (56.96)  | 23 (29.87)  |

| Dependents | No | Yes |
|------------|----|-----|
| No         | 85 (53.8) | 73 (46.2) |
| Yes        | 54 (70.13) | 23 (29.87) |

| Employment | No | Yes |
|------------|----|-----|
| Employment| 5.72, 0.017 | 139 (59.15) |

| Employment | No | Yes |
|------------|----|-----|
| Employment| 96 (40.85) | 139 (59.15) |

*Marital status*

*Dependents*

*Employment*
| Permanent Contract | 100 (63.29) | 58 (36.71) | 40 (51.95) | 37 (48.05) | 2.77, 0.096 |
|-------------------|------------|------------|------------|------------|-------------|
| Other             | 140 (59.57)| 95 (40.43) |            |            |             |

**Job ranking**

| Superior          | 129 (81.65)| 29 (18.35)| 70 (90.91) | 7 (9.09)    | 3.42, 0.064 |
|-------------------|------------|------------|------------|-------------|-------------|
| Other             | 199 (84.68)| 36 (15.32) |            |             |             |

**Hours per week**

| Regular (40hrs per week) | 73 (46.2) | 85 (53.8) | 40 (51.95) | 37 (48.05) |
|--------------------------|-----------|-----------|------------|------------|
0.68, 0.408
113(48.09)
122(51.91)
5.24 ± 7.1
*Work experience: median (LQ, UQ)
2(0.75,4.5)
1(0.67,2)
0.0013
1.17(0.75,4)

SD: Standard Deviation; * the duration of service (years) in the current role; LQ: Lower Quartile; UQ: Upper Quartile; p values in bold are statistically significant

More than three-quarters (84%; 95%CI = 78.51–88.03) of the respondents reported depression in the past week. Only 6% (95% CI = 3.24–9.37) of respondents reported being diagnosed with insomnia in the past 1 year. Table 2 shows that employment status, age, marital status and responsibility for dependents were the background characteristics significantly associated with depression whereas only marital status and responsibility for dependents were significantly associated with insomnia. Occupational stress was also significantly associated with insomnia but not depression. After controlling for the effect of other variables, sex predicted the highest risk of depression. Table 3 displays the effect of CEM on the relative risk (RR) predicted by each variable. There was a 20% [ARR; 95% CI = 1.20 (1.06–1.36)] increased risk of reporting depression among females compared to males after conducting Poisson regression with CEM. However, of all variables, occupational stress was the least predictor of depression. The estimated risk of reporting depression among employees who perceived stress from work was 5% [ARR; 95% CI = 1.05 (0.94–1.17)] after adjusting for other background characteristics. Moreover, this risk reduced to 3% [ARR; 95% CI = 1.03(0.91–1.17)] after Poisson regression with CEM. All background characteristics in exception of occupational stress and job ranking predicted higher RR for depression after conducting this procedure. Generally, the odds ratios (ORs) were far higher than the RRs.
The RRs from ordinary Poisson regression analysis were lower compared to ORs for insomnia predicted by most of the variables. Nonetheless, the two measures of association were similar for job ranking, type of employment, work experience, smoking status and responsibility for dependents. After conducting Poisson regression with CEM analysis, similar to what was observed for depression, the RR predicted by occupational stress and employment type reduced whereas it increased for all other variables. Controlling for background characteristics, employees who perceived occupational stress had 2.58 times the risk of reporting insomnia [ARR; 95% CI = 2.58 (0.83–8.00)] compared to those who did not perceive stress from their jobs and this risk reduced to 2.46 [ARR; 95% CI = 2.46 (0.77–7.87)] after employing Poisson regression with CEM. Alcohol intake posed the highest risk of reporting insomnia compared to other background characteristics whereas employment posed the least (Table 4).

Table 2
Bivariate analysis of factors associated with depression and insomnia using the Chi-square test of independence

| Characteristics          | Depression n(%) | Insomnia n (%) |
|--------------------------|-----------------|----------------|
|                          | χ², p            | χ², p          |
| Overall occupational stress | No (38)          | Yes (197)      |
|                          | Yes (221)       | No (13)        |
|                          |                 | Yes            |

Table 4

28(73.68)
10(26.32)
130(65.99)
67(34.01)
0.86, 0.355
152(68.78)
69(31.22)
5(38.46)
8(61.54)
5.11, 0.024

Age groups
20–29 years
30–39 years
40–49 years

13(34.21)
20(52.63)
5(13.16)
113(57.36)
54(27.41)
30(15.23)
9.71, 0.008
29(25,36)*
26(25,27)*
0.064*

Sex
Males
Females
25(65.79)
13(34.21)
99(50.25)
98(49.75)
3.08, 0.079
117(52.94)
104(47.06)
6(46.15)
7(53.85)
0.23, 0.634

Marital status
Married
Single
24(63.16)
14(36.84)
67(34.01)
130(65.99)
11.4, 0.001
90(40.72)
131(59.28)
0
13(100)
8.60, 0.003

Dependents
No
Yes
17(44.74)
|    |    |    |    |    |
|----|----|----|----|----|
| 21 | 122 | 75 | 3.90 | 127 |
| 122 | 75 | 3.90 | 127 | 6.18 |

**Employment**

| Permanent | Contract |
|-----------|----------|
| 30(78.95) | 8(21.05) |
| 110(55.84) | 87(44.16) |
| 7.06 | 0.008 |
| 131(59.28) | 90(40.72) |
| 8(61.54) | 5(38.46) |
| 0.03 | 0.872 |

**Job ranking**

| Other | Superior |
|-------|----------|
| 32(84.21) | 6(15.79) |
167(84.77)
30(15.23)
0.01, 0.930
186(84.16)
35(15.84)
12(92.31)
1(7.69)
0.63, 0.429

*Hours per week*

Regular
Overtime

16(42.11)
22(57.89)
97(49.24)
100(50.76)
0.65, 0.420
108(48.87)
113(51.13)
4(30.77)
9(69.23)
1.61, 0.204

*Work experience: median (LQ, UQ)*

2(1,4)
1.2(0.67,3.5)
0.120
1.3(0.75,4.0)
1(0.67,1.25)
| Alcohol intake | No | Yes |
|---------------|----|-----|
|                | 34  | 3   |
|                | 164 | 16  |
| 1.79, 0.181   |    |    |
| 189(85.52)    |    |    |
| 32(14.48)     |    |    |
| 9(69.23)      |    |    |
| 4(30.77)      |    |    |
| 2.50, 0.114   |    |    |

| Smoking status | No | Yes |
|---------------|----|-----|
|                | 37 | 0   |
|                | 183| 14  |
| 2.80, 0.094   |    |    |
| 208(94.12)    |    |    |
| 13(5.88)      |    |    |
| 12(92.31)     |    |    |
| 1(7.69)       |    |    |
| 0.07, 0.789   |    |    |
* The Kruskal Wallis test was conducted to assess if insomnia significantly differed between age groups; p values in bold are statistically significant

**Table 3**

Estimating the impact of occupational stress on depression: Modified Poisson regression with CEM

| Variables | Poisson regression with CEM | Sensitivity Analysis | Ordinary Poisson regression analysis | Logistic regression analysis | Probit regression analysis |
|-----------|-----------------------------|----------------------|--------------------------------------|-----------------------------|--------------------------|
| Depression | RR [95% CI] | RR [95% CI] | OR [95% CI] | β [95% CI] |
| Occupational stress | No stress | Stress | Ref | Ref | Ref |
| Ref | 1.03 [0.91–1.17] | Ref | 1.05 [0.94–1.17] | Ref | 1.43 [0.61–3.39] |
| Ref | 0.23 [–0.25–0.71] | |

**Age groups**
18–29 years
30–49 years
¥
Ref
0.95[0.81–1.12]
Ref
0.83[0.27–2.52]
Ref
-0.07[–0.69–0.55]
Sex
Males
Ref
1.20[1.06–1.36]
Ref
1.11[0.99–1.24]
Ref
2.11[0.96–4.67]
Ref
0.42[0.02–0.86]
Marital status
Married
Single
¥
Ref
1.28[1.03–1.59]*
Ref
|                | Ref    | Ref    | Ref    | Ref    |
|----------------|--------|--------|--------|--------|
|                |        |        |        |        |
| **4.04[1.22–13.33]** | *      |        |        |        |
| **Dependents** | No     | Yes    | ¥      |        |
| **Ref**        |        |        |        |        |
| **0.78[0.10–1.46]** | *      |        |        |        |
| **Employment** | Permanent | Contract |        |        |
| **Ref**        |        |        |        |        |
| **1.10[0.91–1.34]** |        |        |        |        |
| **Ref**        |        |        |        |        |
| **1.61[0.53–4.92]** |        |        |        |        |
| **Ref**        |        |        |        |        |
| **0.27[–0.36–0.91]** |        |        |        |        |
| **Job ranking** | Other | Superior |        |        |
Ref
1.08[0.94–1.23]
Ref
1.13[0.95–1.34]
Ref
1.99[0.68–5.82]
Ref
0.39[–0.21–0.99]

*Hours per week*

Regular

Overtime

Ref
1.06[0.94–1.21]
Ref
0.96[0.86–1.07]
Ref
0.74[0.34–1.60]
Ref
–0.12[–0.54–0.31]

*Work experience*

¥
1.02[1.00–1.04]
1.13[0.96–1.33]
0.07[–0.02–0.16]

*Alcohol intake*

No
Yes
Ref
1.13[0.97–1.33]
Ref
1.11[0.98–1.25]
Ref
2.23[0.59–8.37]
Ref
0.7[-0.24–1.17]
P-value notation: ***p<0.001; **p<0.01, *p<0.05;¥: these variables were excluded from the model due to CEM.

Table 4
Estimating the impact of occupational stress on Insomnia: Modified Poisson regression with CEM

| Variables                  | Insomnia          | Poisson regression with CEM |
|----------------------------|-------------------|-----------------------------|
| Sensitivity Analysis       |                   |                             |
| Ordinary Poisson regression analysis | RR [95% CI]          |                             |
| Logistic regression analysis | OR [95% CI]        |                             |
| Probit regression analysis | β [95% CI]         |                             |

Occupational stress
No stress
Stress
Ref
| Age groups | 18–29 years | 30–49 years | ¥ years |
|------------|-------------|-------------|---------|
| Ref        | Ref         | Ref         | Ref     |
| 2.46[0.77–7.87] | Ref         | 2.58[0.83–8.00] | Ref     |
| 3.00[0.88–10.28] | Ref         | 0.52[–0.10–1.14] | Ref     |
| Age groups | Sex         |             |         |
|            | Males       | Females     |         |
| Ref        | Ref         | 2.05[0.64–6.62]** | Ref     |
| 1.58[0.53–4.76] | Ref         | 1.72[0.47–6.30] | Ref     |

*Note: The values represent statistical significance levels.** indicates p < 0.01.
|                  | No          | Yes         | ¥            | Ref         |
|------------------|-------------|-------------|--------------|-------------|
| **Dependents**   |             |             |              |             |
|                  | 0.31 [-0.35-0.96] |             |              |             |
| **Employment**   |             |             |              |             |
| **Permanent**    | 0.25 [0.02-3.45] |             |              |             |
| **Contract**     | 0.22 [0.02-2.21] |             |              |             |
|                  | -0.77 [-1.81-0.28] |             |              |             |
| **Job ranking**  |             |             |              |             |
| **Other**        | 0.70 [0.19-2.49]  |             |              |             |
| **Superior**     | 0.36 [0.11-1.18]  |             |              |             |
|                  | 0.30 [0.08-1.16]  |             |              |             |
|                  | -0.59 [-1.27-0.10] |             |              |             |
| Variable                  | Regular | Overtime | Ref | Lower CI | Upper CI |
|--------------------------|---------|----------|-----|----------|----------|
| Hours per week           | 0.57    | 0.52     | Ref | 0.07     | 4.66     |
| Work experience          | Ref     | Ref      | Ref | -0.39    | -0.77    |
| Alcohol intake           | Ref     | Ref      | Ref | 0.43     | -0.23    |
| No                       | Ref     | Ref      | Ref | 0.72     | 1.02     |
| Yes                      | Ref     | Ref      | Ref | 0.69     | 1.24     |
| Yes                      | Ref     | Ref      | Ref | -0.17    | -0.47    |

*Hours per week*

*Work experience*

*Alcohol intake*
Discussion

The results of the study have revealed that almost a third (32.8%) of employees at this telco were stressed from work and more than three-quarters reported depression in the past week, whereas only a few reported being diagnosed of insomnia in the past year. Age, having dependents at home and work experience were the only respondent characteristics that were significantly associated with perceived occupational stress. This study also reveals that occupational stress was only a predictor for reported insomnia but not depression among respondents. There was a higher risk of insomnia among those perceiving stress from work compared to those who did not. In Africa, a similar
prevalence (28.2%) has been recorded among university staff in Ethiopia (22), and higher among Tanzanians (46.5%) (23). In Asia, prevalence varied from high among Indian call centre workers (65.8%) (24) to low among university staff in Malaysia (21.7%) (25). Physicians (51.4%) and nurses (51.2%) who worked in the ICU and anaesthesiology unit at hospitals in Poland (26) were also reported to have work-related stress. However, there is insufficient evidence of the prevalence of occupational stress among telco employees in Africa.

In the current study, workload was the most reported of the four psychosocial stressors assessed whereas role conflict was the least source of stress. This finding is consistent with the observations of other researchers (11,27) who also reported workload as a major stressor in telcos and the hotel industry respectively. Occupational stress was significantly associated with age, having dependents at home and work experience of the employee. Younger employees may have spent a shorter length of time in their roles and may yet be acquiring the needed skills for effective delivery at work as compared to their older counterparts and therefore may be more stressed (28). Similar reasoning is drawn from Sharma and Devi’s (2) finding that a longer duration spent in a job role was inversely related to the job stress reported. Also, employees with dependents may have more stringent allocations for time due to their extra responsibilities at home. Consequently, they may function more effectively under stress compared to those without dependents (29).

Among the respondents of this study, occupational stress was not a risk factor of depression. Tsai, Chi, and Wang (29) reported a similar finding from a longitudinal study conducted on a sample of the older working population in Taiwan. They indicated that their study population comprised of employees nearing retirement (≥50 years) who were more likely to be experiencing diminishing job stress as earlier posited (30). However, they attributed the highest impact on depression to perceived-health stress which was not assessed by this study. Other findings based on cross-sectional (31,32) and longitudinal data (33) reported, contrary to this study, a strong positive association between work-related stress and depression. Yoshizawa et al. (31) specifically indicated social support, job control, and quantitative workload as psychosocial stressors significantly influencing depression among some psychiatric nurses in Japan. Oenning et al. (32) and Romswinkel et al. (33)
assessed job stress in general and among community-dwelling workers as opposed to employees from a specific industry which is the case for this current study. In a lower-middle-income country like Egypt, a positive correlation between work stress and depression was reported (34). Similar to this study, these researchers assessed both depression and occupational stress using self-reports except for Oenning et al. (32) who used a diagnostic tool to measure depressive disorder. The robust risk estimation from this study may account for the lack of association between occupational stress and depression. However, the effect of residual confounding on this association from risk factors like income, educational level, life events, personality traits, earlier psychiatric morbidity and family history (35) which were not measured and controlled for in this study cannot be overlooked.

Occupational stress has been reported to facilitate the development of sleep problems (7). Elger and Sekera (36) indicated that stressful events predicted insomnia, the most prevalent sleep disorder (37). The current study identified occupational stress as an important risk factor of insomnia. Almost all employees reported quantitative workload as a stressor. The aftermath of this stress could have been after-work fatigue which influences the experience of insomnia. Also, high levels of work rumination may advance worry (9). The daily psychological strain as a consequence of worrying about workload could have contributed to this occupational stress-related insomnia observed in this study. This is informative to employers especially in telcos of the possible effect of workload stress on workers’ psychological health. It has been proven that reducing weekly work hours of employees by a quarter could significantly reduce workload and increase the time they spend on recovery activities on weekdays (38), improve sleep quality (39) and consequently reduce occupational stress (40). Our study indicated a higher risk of insomnia among those who worked overtime compared to those who worked regular hours. Hence, employers in Ghanaian telcos could curb occupational stress and its increased risk of insomnia by putting measures in place to ensure employees spend minimal time working beyond regular hours.

Implications for future research

There is a paucity in literature regarding the impact of occupational stress on depression and insomnia in telcos, especially in Africa. To this end, this study provides preliminary findings which can
form the basis for further work, probably longitudinal studies, to document a clear linkage between occupation-related stress and depression as well as insomnia. This will help report on their peculiar experiences of stress and the two psychiatric conditions. Generally, the odds ratios were far higher than the risk ratios estimated from the Poisson regression with CEM in this study, suggesting an overestimation of the strength of prediction by the variables if only odds ratios were used. This analytical method could be adopted in cross-sectional studies to increase the weight of evidence produced on the predictive power of variables and make them comparable to estimates from longitudinal studies.

Study limitations

The findings from this study were mainly based on self-reported measures which are highly subjective. Also, the evidence from this study as is the case for other cross-sectional studies need supplementation from longitudinal studies. The use of findings from this observational study to estimate relative risk should be interpreted with caution as it may be associated with reverse causality bias although a rigorous statistical procedure was used.

Conclusions

About a third of employees at the telco studied reported occupational stress whereas depression was reported by over three-quarters of them. Only a few reported being diagnosed with insomnia in the past year. Occupational stress increases the risk of insomnia. However, this study did not find a statistically significant relationship between depression and occupational stress. Findings from this study are informative to employers in the Ghanaian telecommunication sector to conduct routine assessments of the mental health of their employees and explore psychosocial hazards reported by them. This will contribute to effective interventions, including ensuring employees spend minimal time working beyond regular hours, to protect their health holistically.

Declarations

Ethics approval and consent to participate

This study was approved by the Ghana Health Service Ethical Review Committee of the Research and Development Division, Accra (046/01/18). All respondents provided written informed consent. No
experimental interventions were performed.

Consent for publication

Not applicable

Availability of data and material

The datasets used and analyzed during this study are available from the corresponding author on reasonable request.

Competing interests

The authors declare no conflicts of interest. The content and writing of the paper were carried out solely by the authors.

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Authors’ contributions

EEK developed research concept and design, collected data, conducted data analysis, and interpretation as well as preparation of the manuscript. DD contributed to the study design, data analysis, interpretation of results and reviewed manuscript. MD contributed to the development of the research concept and design, interpretation of results and reviewed manuscript. All authors read and approved the final draft for submission.

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Methods
Selection and description of participants

Ethical approval (GHS-ERC Number: 046/01/18) was obtained from the Ghana Health Service Ethical Review Committee of the Research and Development Division, Accra, before conducting this analytical cross-sectional study. The study population comprised of employees, both permanent and contract staff, working at the Head Office of a Ghanaian telco in Accra. Study participants were selected by simple random sampling proportionate to the size of their departments. By this, all employees in this organization had equal opportunities to be part of the study and the diversity in their job descriptions were also catered for.

Data collection tool and technique

Data were collected on the variables of interest using a structured self-administered questionnaire constructed in English and adapted from the National Institute for Occupational Safety and Health (NIOSH) Generic Job Stress Questionnaire (GJSQ) (13). This tool has shown high validity and reliability: (0.65-0.90) (14) and (0.68-0.95) (15,16). The questionnaire was divided into three sections; the first
section gathered data on respondents’ sociodemographic and job characteristics. Occupational stress was measured using a composite scale under four domains of workplace psychosocial stressors in section two: quantitative workload (4 items; 5-point Likert scale), responsibility for others (4 items; 5-point Likert scale), role conflict (4 items; 7-point Likert scale) and role ambiguity (5 items; 7-point Likert scale). In section three, the Center for Epidemiologic Studies Depression Scale (CES-D) as employed in the GJSQ was used to measure depression (reported symptoms of depression for the past 1 week) using a composite scale (14 items; 4-point Likert scale) whereas insomnia (reported clinical diagnosis of insomnia in the past 1 year) was measured using a single item with a binary response (1=Yes, 0=No). Also, two items in this section obtained respondent information on two lifestyle patterns: smoking and alcohol intake. Scoring keys provided by NIOSH Generic Job Stress Questionnaire were used to convert responses into quantitative measurements for analysis. The maximum period of time estimated for filling out a questionnaire was 10 minutes. Data collection was carried out for 5 weeks concurrently with data entry and cleaning.

**Statistical analysis**

Respondents’ data from completed questionnaires were entered manually into an excel form (Excel version 2016). A coding frame containing the scores corresponding to the responses on the questionnaires served as a guide for data entry to aid ‘translate’ the survey data into a workable dataset.

Descriptive (mean, median) and inferential statistics (hypothesis testing) were obtained from data gathered using the STATA version 15 software. The various ranges of scores for composite variables were as follows: workload and responsibility for others (0-16); role ambiguity (0-30); role conflict (0-24); overall occupational stress (0-86); depression (0-42) and work productivity (0-60). Higher scores implied higher perceived occupational stress and depression respectively. Total scores for each composite variable were converted into percentages before categorizing them. Overall occupational stress and the stress from the four psychosocial stressors were first categorized into a five-level ordinal scale: normal (0 – 33); mild (33.1 – 43); moderate (43.1 – 60); severe (60.1 – 79) and very severe (≥ 80) according to the Depression, Anxiety and Stress Scale (DASS).(17) Overall occupational stress was re-categorized into two levels: no stress and stress using the median as a cut off. Depression was also re-categorized into two levels: no depression (normal:0 – 15) and depressed (mild:15.1 – 33; moderate:33.1 – 52; major:52.1 – 70; and severe depression:≥ 70.1) based on initial categorization adopted from a previous paper (18). The Skewness/Kurtosis test for normality was conducted to assess the distributions of each composite variable before categorization. The Chi-square test of independence and the Kruskal Wallis test were employed to assess the significance of
associations with subsequent sensitivity analysis using Multiple logistic, Poisson and Probit regression models. To estimate sample average treatment effect (occupational stress) on the treated (respondents who perceived occupational stress), this study employed Coarsened Exact Matching (CEM) to improve on the estimation of the causal effect of occupation stress on depression and insomnia by reducing the imbalance in covariates between treated and control (respondents who did not perceive occupational stress) groups. The advantages of using CEM instead of other matching procedures have been well documented (19–21). The statistic that measures overall covariate imbalance between workers with stress and those with no stress before and after matching were estimated. The results from the Chi-square test of independence showed an only statistical significant relationship between occupational stress and age of the workers, responsibility for dependents as well as work experience hence the CEM procedure was restricted to only these three variables. However, to improve the precision of our impact estimate and to adjust for the remaining imbalance with other covariates, a Poisson regression model with robust standard error was used to adjust for these other covariates.

**Results**

A total of 235 respondents provided complete data in their self-administered questionnaires (96% response rate) and their demographic characteristics are presented in Table 1. The mean age for the sample was 30.84 ± 6.9 years with 53.6% of respondents within the age range of 20-29 years. More males (52.8%) than females participated in this study just as there were more singles (61.3%) than married. Respondents who reported to have at least one dependent at home (40.9%) were fewer than those who had no dependents. For job characteristics, more respondents (59.6%) were permanent employees and 51.9% worked overtime (more than 40 hours per week) for an average of 5.24 ± 7.1 hours per week. Employees who had worked for a maximum of 5 years were 86.8%.

All four psychosocial stressors: workload (97.9%), responsibility for others (50.6%), role ambiguity (34.5%) and role conflict (17.0%) were reported by respondents. The prevalence of overall occupational stress at this telco was 32.8% (95% CI= 26.7-38.8). The proportions of respondents who reported occupational stress by background characteristics are displayed in Table 1. More employees who reported stress from their jobs were in the 20-29 years’ category (64.9%) and more males (58.4%) than females also reported the same. Perceived occupational stress was higher among singles (70.1%), respondents without dependents (70.1%), and respondents on permanent employment (52.0%). Fifty percent of respondents who reported occupational stress had worked for at least one year in their current role. The Chi-square test of independence revealed that occupational
stress was only significantly associated with age, responsibility for dependents at home and work experience.

Table 1
Distribution of occupational stress by background characteristics

| Characteristics       | Occupational stress levels n (%) | χ² value, p |
|----------------------|---------------------------------|------------|
|                      | No Stress (158)                  | Stress (77) |
| **Age groups**       |                                 |            |
| 20-29 years          | 76 (48.10)                       | 50 (64.94)  |
| 30-39 years          | 53 (33.54)                       | 21 (27.27)  |
| 40-49 years          | 29 (18.35)                       | 6 (7.79)    |
| Mean age ±SD         |                                 |            |
| Sex                  |                                 |            |
| Males                | 79 (50.00)                       | 45 (58.44)  |
| Females              | 79 (50.00)                       | 32 (41.56)  |
| **Marital status**   |                                 | 3.78, 0.052 |
| Married              | 68 (43.04)                       | 23 (29.87)  |
| Single               | 90 (56.96)                       | 54 (70.13)  |
| **Dependents**       |                                 | 5.72, 0.017 |
| No                   | 85 (53.8)                        | 54 (70.13)  |
| Yes                  | 73 (46.2)                        | 23 (29.87)  |
| **Employment**       |                                 | 2.77, 0.096 |
| Permanent            | 100 (63.29)                      | 40 (51.95)  |
| Contract             | 58 (36.71)                       | 37 (48.05)  |
| **Job ranking**      |                                 | 3.42, 0.064 |
| Other                | 129 (81.65)                      | 70 (90.91)  |
| Superior             | 29 (18.35)                       | 7 (9.09)    |
| **Hours per week**   |                                 | 0.68, 0.408 |
| Regular (40hrs per week) | 73 (46.2)                      | 40 (51.95)  |
| Overtime             | 85 (53.8)                        | 37 (48.05)  |
| Mean hours overtime ±SD |                                 | 122(       |
| *Work experience: median (LQ, UQ) | 0.0013                          | 2 (0.75,4.5) |
|                      |                                 | 1 (0.67,2)  |

SD: Standard Deviation; * the duration of service (years) in the current role; LQ: Lower Quartile; UQ: Upper Quartile; p values in bold are statistically significant
More than three-quarters (84%; 95%CI= 78.51-88.03) of the respondents reported depression in the past week. Only 6% (95% CI= 3.24-9.37) of respondents reported being diagnosed with insomnia in the past 1 year. Table 2 shows that employment status, age, marital status and responsibility for dependents were the background characteristics significantly associated with depression whereas only marital status and responsibility for dependents were significantly associated with insomnia. Occupational stress was also significantly associated with insomnia but not depression. After controlling for the effect of other variables, sex predicted the highest risk of depression. Table 3 displays the effect of CEM on the relative risk (RR) predicted by each variable. There was a 20% [ARR; 95% CI=1.20 (1.06-1.36)] increased risk of reporting depression among females compared to males after conducting Poisson regression with CEM. However, of all variables, occupational stress was the least predictor of depression. The estimated risk of reporting depression among employees who perceived stress from work was 5% [ARR; 95% CI=1.05 (0.94-1.17)] after adjusting for other background characteristics. Moreover, this risk reduced to 3% [ARR; 95% CI=1.03(0.91-1.17)] after Poisson regression with CEM. All background characteristics in exception of occupational stress and job ranking predicted higher RR for depression after conducting this procedure. Generally, the odds ratios (ORs) were far higher than the RR.

The RR from ordinary Poisson regression analysis were lower compared to ORs for insomnia predicted by most of the variables. Nonetheless, the two measures of association were similar for job ranking, type of employment, work experience, smoking status and responsibility for dependents. After conducting Poisson regression with CEM analysis, similar to what was observed for depression, the RR predicted by occupational stress and employment type reduced whereas it increased for all other variables. Controlling for background characteristics, employees who perceived occupational stress had 2.58 times the risk of reporting insomnia [ARR; 95% CI=2.58 (0.83-8.00)] compared to those who did not perceive stress from their jobs and this risk reduced to 2.46 [ARR; 95% CI=2.46 (0.77-7.87)] after employing Poisson regression with CEM. Alcohol intake posed the highest risk of reporting insomnia compared to other background characteristics whereas employment posed the least (Table 4).

Table 2
Bivariate analysis of factors associated with depression and insomnia using the Chi-square test of independence
| Characteristics                    | Depression n(%) | $\chi^2$, $p$ | Insomnia n (%) |
|-----------------------------------|----------------|---------------|----------------|
|                                   | No (38)        | Yes (197)     | No (221)       | Yes (13)       |
| Overall occupational stress      |                | 0.86, 0.355   |                |
| No                                | 28(73.68)      | 130(65.99)    | 152(68.78)     | 5(38.46)       |
| Yes                               | 10(26.32)      | 67(34.01)     | 69(31.22)      | 8(61.54)       |
| Age groups                        |                | 9.71, **0.008**|                |
| 20-29 years                       | 13(34.21)      | 113(57.36)    | 29(25,36)*     | 26(25,27)*     |
| 30-39 years                       | 20(52.63)      | 54(27.41)     |                |                |
| 40-49 years                       | 5(13.16)       | 30(15.23)     |                |                |
| Sex                               |                | 3.08, 0.079   |                |
| Males                             | 25(65.79)      | 99(50.25)     | 117(52.94)     | 6(46.15)       |
| Females                           | 13(34.21)      | 98(49.75)     | 104(47.06)     | 7(53.85)       |
| Marital status                    |                | 11.4, **0.001**|                |
| Married                           | 24(63.16)      | 67(34.01)     | 90(40.72)      | 0              |
| Single                            | 14(36.84)      | 130(65.99)    | 131(59.28)     | 13(100)        |
| Dependents                        |                | 3.90, **0.048**|                |
| No                                | 17(44.74)      | 122(61.93)    | 127(57.47)     | 12(92.31)      |
| Yes                               | 21(55.26)      | 75(38.07)     | 94(42.53)      | 1(7.69)        |
| Employment                        |                | 7.06, **0.008**|                |
| Permanent                         | 30(78.95)      | 110(55.84)    | 131(59.28)     | 8(61.54)       |
| Contract                          | 8(21.05)       | 87(44.16)     | 90(40.72)      | 5(38.46)       |
| Job ranking                       |                | 0.01, 0.930   |                |
| Other                             | 32(84.21)      | 167(84.77)    | 186(84.16)     | 12(92.31)      |
| Superior                          | 6(15.79)       | 30(15.23)     | 35(15.84)      | 1(7.69)        |
| Hours per week                    |                | 0.65, 0.420   |                |
| Regular                           | 16(42.11)      | 97(49.24)     | 108(48.87)     | 4(30.77)       |
| Overtime                          | 22(57.89)      | 100(50.76)    | 113(51.13)     | 9(69.23)       |
| Work experience: median (LQ, UQ)  | 2(1.4)         | 1.2(0.67,3.5) | 1.3(0.75,4.0)  | 1(0.67,1.25)   |
| Alcohol intake                    |                | 1.79, 0.181   |                |
| No                                | 34(91.89)      | 164(83.25)    | 189(85.52)     | 9(69.23)       |
| Yes                               | 3(8.11)        | 33(16.75)     | 32(14.48)      | 4(30.77)       |
| Smoking status                    |                | 2.80, 0.094   |                |
| No                                | 37(100)        | 183(92.89)    | 208(94.12)     | 12(92.31)      |
| Yes                               | 0              | 14(7.11)      | 13(5.88)       | 1(7.69)        |

* The Kruskal Wallis test was conducted to assess if insomnia significantly differed between age groups; $p$ values in bold are statistically significant.
Table 3
Estimating the impact of occupational stress on depression: Modified Poisson regression with CEM

| Variables                | Poisson regression with CEM | Ordinary Poisson regression analysis | Sensitivity Analysis | Logistic regression analysis |
|--------------------------|-----------------------------|--------------------------------------|----------------------|-----------------------------|
|                          | RR [95% CI]                 | RR [95% CI]                          | OR [95% CI]          | β [95% CI]                  |
| Occupational stress      |                             |                                     |                      |                             |
| No stress                | Ref 1.03[0.91-1.17]         | Ref 1.05[0.94-1.17]                  | Ref 1.43[0.61-3.39]  | Ref 0.23[-0.25-0.71]        |
| Stress                   |                             |                                     |                      |                             |
| Age groups               |                             |                                     |                      |                             |
| 18-29 years              | ¥                           | Ref 0.95[0.81-1.12]                  | Ref 0.83[0.27-2.52]  | Ref -0.07[-0.69-0.55]       |
| 30-49 years              |                             |                                     |                      |                             |
| Sex                      |                             |                                     |                      |                             |
| Males                    | Ref 1.20[1.06-1.36]         | Ref 1.11[0.99-1.24]                  | Ref 2.11[0.96-4.67]  | Ref 0.42[0.02-0.86]         |
| Females                  |                             |                                     |                      |                             |
| Marital status           |                             |                                     |                      |                             |
| Married                  | ¥                           | Ref 1.28[1.03-1.59]*                 | Ref 4.04[1.22-13.33]*| Ref 0.78[0.10-1.46]*        |
| Single                   |                             |                                     |                      |                             |
| Dependents               |                             |                                     |                      |                             |
| No                       | ¥                           | Ref 1.10[0.91-1.34]                  | Ref 1.61[0.53-4.92]  | Ref 0.27[-0.36-0.91]        |
| Yes                      |                             |                                     |                      |                             |
| Employment               |                             |                                     |                      |                             |
| Permanent                | Ref 1.14[1.01-1.29]         | Ref 1.11[0.99-1.26]                  | Ref 2.43[0.88-6.65]  | Ref 0.50[-0.04-1.05]        |
| Contract                 |                             |                                     |                      |                             |
| Job ranking              |                             |                                     |                      |                             |
| Other                    | Ref 1.08[0.94-1.23]         | Ref 1.13[0.95-1.34]                  | Ref 1.99[0.68-5.82]  | Ref 0.39[-0.21-0.99]        |
| Superior                 |                             |                                     |                      |                             |
| Hours per week           |                             |                                     |                      |                             |
| Regular                  | Ref 1.06[0.94-1.21]         | Ref 0.96[0.86-1.07]                  | Ref 0.74[0.34-1.60]  | Ref -0.12[-0.54-0.31]       |
| Overtime                 |                             |                                     |                      |                             |
| Work experience          | ¥                           | 1.02[1.00-1.04]                     | 1.13[0.96-1.33]      | 0.07[-0.02-0.16]            |
| Alcohol intake           |                             |                                     |                      |                             |
| No                       | Ref 1.13[0.97-1.33]         | Ref 1.11[0.98-1.25]                  | Ref 2.23[0.59-8.37]  | Ref 0.7[-0.24-1.17]         |
| Yes                      |                             |                                     |                      |                             |

P-value notation: ***p<0.001; **p<0.01, *p<0.05; ¥: these variables were excluded from the model due to CEM.
| Variables             | Poisson regression with CEM | Ordinary Poisson regression analysis | Logistic regression analysis | Probit regression analysis | β     |
|-----------------------|-----------------------------|--------------------------------------|-----------------------------|---------------------------|-------|
|                      | RR [95% CI]                 | RR [95% CI]                          | OR [95% CI]                 |                           |       |
| **Occupational stress** |                             |                                      |                             |                           |       |
| No stress             | Ref                         | Ref                                  | Ref                         |                           |       |
| Stress                | 2.46[0.77-7.87]             | 2.58[0.83-8.00]                      | 3.00[0.88-10.28]            | 0.52[-0.1]                |       |
| **Age groups**        |                             |                                      |                             |                           |       |
| 18-29 years           | ¥                           | Ref                                  | Ref                         |                           |       |
| 30-49 years           |                             | 0.61[0.06-5.90]                      | 0.57[0.08-3.84]            | -0.28[-1.]                |       |
| **Sex**               |                             |                                      |                             |                           |       |
| Males                 | Ref                         | Ref                                  | Ref                         |                           |       |
| Females               | 2.05[0.64-6.62]**           | 1.58[0.53-4.76]                      | 1.72[0.47-6.30]            | 0.31[-0.3]                |       |
| **Dependents**        |                             |                                      |                             |                           |       |
| No                    | ¥                           | Ref                                  | Ref                         |                           |       |
| Yes                   |                             | 0.25[0.02-3.45]                      | 0.22[0.02-2.21]            | -0.77[-1.1]               |       |
| **Employment**        |                             |                                      |                             |                           |       |
| Permanent             | Ref                         | Ref                                  | Ref                         |                           |       |
| Contract              | 0.70[0.19-2.49]*            | 0.36[0.11-1.18]                      | 0.30[0.08-1.16]            | -0.59[-1.5]               |       |
| **Job ranking**       |                             |                                      |                             |                           |       |
| Other                 | Ref                         | Ref                                  | Ref                         |                           |       |
| Superior              | 0.53[0.08-3.44]             | 0.57[0.07-4.66]                      | 0.52[0.05-5.15]            | -0.39[-1.1]               |       |
| **Hours per week**    |                             |                                      |                             |                           |       |
| Regular               | Ref                         | Ref                                  | Ref                         |                           |       |
| Overtime              | 2.29[0.70-7.52]             | 2.07[0.65-6.62]                      | 2.32[0.62-8.73]            | 0.43[-0.2]                |       |
| **Work experience**   |                             |                                      |                             |                           |       |
| ¥                     |                             | 0.72[0.51-1.02]                      | 0.69[0.39-1.24]            | -0.17[-0.4]               |       |
| **Alcohol intake**    |                             |                                      |                             |                           |       |
| No                    | Ref                         | Ref                                  | Ref                         |                           |       |
| Yes                   | 3.15[0.78-12.73]            | 1.77[0.41-7.74]                      | 1.95[0.44-8.69]            | 0.38[-0.3]                |       |
| **Smoking status**    |                             |                                      |                             |                           |       |
| No                    | Ref                         | Ref                                  | Ref                         |                           |       |
| Yes                   | 0.27[0.03-2.91]             | 0.54[0.04-6.63]                      | 0.49[0.05-5.41]            | -0.27[-1.4]               |       |

P-value notation: ***p<0.001; **p<0.01, *p<0.05; ¥: these variables were excluded from the model due to CEM.
Discussion
The results of the study have revealed that almost a third (32.8%) of employees at this telco were stressed from work and more than three-quarters reported depression in the past week, whereas only a few reported being diagnosed of insomnia in the past year. Age, having dependents at home and work experience were the only respondent characteristics that were significantly associated with perceived occupational stress. This study also reveals that occupational stress was only a predictor for reported insomnia but not depression among respondents. There was a higher risk of insomnia among those perceiving stress from work compared to those who did not. In Africa, a similar prevalence (28.2%) has been recorded among university staff in Ethiopia(22), and higher among Tanzanians (46.5%) (23). In Asia, prevalence varied from high among Indian call centre workers (65.8%)(24) to low among university staff in Malaysia (21.7%) (25). Physicians (51.4%) and nurses (51.2%) who worked in the ICU and anaesthesiology unit at hospitals in Poland(26) were also reported to have work-related stress. However, there is insufficient evidence of the prevalence of occupational stress among telco employees in Africa.

In the current study, workload was the most reported of the four psychosocial stressors assessed whereas role conflict was the least source of stress. This finding is consistent with the observations of other researchers (11,27) who also reported workload as a major stressor in telcos and the hotel industry respectively. Occupational stress was significantly associated with age, having dependents at home and work experience of the employee. Younger employees may have spent a shorter length of time in their roles and may yet be acquiring the needed skills for effective delivery at work as compared to their older counterparts and therefore may be more stressed (28). Similar reasoning is drawn from Sharma and Devi’s (2) finding that a longer duration spent in a job role was inversely related to the job stress reported. Also, employees with dependents may have more stringent allocations for time due to their extra responsibilities at home. Consequently, they may function more effectively under stress compared to those without dependents (29).

Among the respondents of this study, occupational stress was not a risk factor of depression. Tsai, Chi, and Wang (29) reported a similar finding from a longitudinal study conducted on a sample of the older working population in Taiwan. They indicated that their study population comprised of employees nearing retirement (≥50 years) who were more likely to be experiencing diminishing job stress as earlier posited (30). However, they attributed the highest impact on depression to perceived-health stress which was not assessed by this study. Other findings based on cross-
sectional (31, 32) and longitudinal data (33) reported, contrary to this study, a strong positive association between work-related stress and depression. Yoshizawa et al. (31) specifically indicated social support, job control, and quantitative workload as psychosocial stressors significantly influencing depression among some psychiatric nurses in Japan. Oenning et al. (32) and Romswinkel et al. (33) assessed job stress in general and among community-dwelling workers as opposed to employees from a specific industry which is the case for this current study. In a lower-middle-income country like Egypt, a positive correlation between work stress and depression was reported (34). Similar to this study, these researchers assessed both depression and occupational stress using self-reports except for Oenning et al. (32) who used a diagnostic tool to measure depressive disorder. The robust risk estimation from this study may account for the lack of association between occupational stress and depression. However, the effect of residual confounding on this association from risk factors like income, educational level, life events, personality traits, earlier psychiatric morbidity and family history (35) which were not measured and controlled for in this study cannot be overlooked.

Occupational stress has been reported to facilitate the development of sleep problems (7). Elger and Sekera (36) indicated that stressful events predicted insomnia, the most prevalent sleep disorder (37). The current study identified occupational stress as an important risk factor of insomnia. Almost all employees reported quantitative workload as a stressor. The aftermath of this stress could have been after-work fatigue which influences the experience of insomnia. Also, high levels of work rumination may advance worry (9). The daily psychological strain as a consequence of worrying about workload could have contributed to this occupational stress-related insomnia observed in this study.

This is informative to employers especially in telcos of the possible effect of workload stress on workers’ psychological health. It has been proven that reducing weekly work hours of employees by a quarter could significantly reduce workload and increase the time they spend on recovery activities on weekdays (38), improve sleep quality (39) and consequently reduce occupational stress (40). Our study indicated a higher risk of insomnia among those who worked overtime compared to those who worked regular hours. Hence, employers in Ghanaian telcos could curb occupational stress and its increased risk of insomnia by putting measures in place to ensure employees spend minimal time working beyond regular hours.

Implications for future research

There is a paucity in literature regarding the impact of occupational stress on depression and insomnia in telcos, especially in Africa. To this end, this study provides preliminary findings which can form the basis for further work, probably longitudinal studies, to document a clear linkage between...
occupation-related stress and depression as well as insomnia. This will help report on their peculiar experiences of stress and the two psychiatric conditions. Generally, the odds ratios were far higher than the risk ratios estimated from the Poisson regression with CEM in this study, suggesting an overestimation of the strength of prediction by the variables if only odds ratios were used. This analytical method could be adopted in cross-sectional studies to increase the weight of evidence produced on the predictive power of variables and make them comparable to estimates from longitudinal studies.

Study limitations

The findings from this study were mainly based on self-reported measures which are highly subjective. Also, the evidence from this study as is the case for other cross-sectional studies need supplementation from longitudinal studies. The use of findings from this observational study to estimate relative risk should be interpreted with caution as it may be associated with reverse causality bias although a rigorous statistical procedure was used.

Conclusions

About a third of employees at the telco studied reported occupational stress whereas depression was reported by over three-quarters of them. Only a few reported being diagnosed with insomnia in the past year. Occupational stress increases the risk of insomnia. However, this study did not find a statistically significant relationship between depression and occupational stress. Findings from this study are informative to employers in the Ghanaian telecommunication sector to conduct routine assessments of the mental health of their employees and explore psychosocial hazards reported by them. This will contribute to effective interventions, including ensuring employees spend minimal time working beyond regular hours, to protect their health holistically.

Declarations

Ethics approval and consent to participate

This study was approved by the Ghana Health Service Ethical Review Committee of the Research and Development Division, Accra (046/01/18). All respondents provided written informed consent. No experimental interventions were performed.

Consent for publication

Not applicable

Availability of data and material

The datasets used and analyzed during this study are available from the corresponding author on
reasonable request.

Competing interests

The authors declare no conflicts of interest. The content and writing of the paper were carried out solely by the authors.

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Authors' contributions

EEK developed research concept and design, collected data, conducted data analysis, and interpretation as well as preparation of the manuscript. DD contributed to the study design, data analysis, interpretation of results and reviewed manuscript. MD contributed to the development of the research concept and design, interpretation of results and reviewed manuscript. All authors read and approved the final draft for submission.

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