



Research article

Stress and job satisfaction among medical laboratory professionals in Oman: A cross-sectional study

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ABSTRACT

Background: Job satisfaction leads to employees being more productive. However, when the job requirements do not meet the capabilities it will cause stress. Therefore, it is important to define the cause of dissatisfaction to reduce work-induced stress as this has a negative impact on the quality of healthcare services. The literature on stress and satisfaction studying medical laboratory professionals (MLPs) is still limited.

The aim of this study was to assess the relationships between stress and job satisfaction factors among MLPs in Omani hospitals, and to quantify a possible correlation between job stress and job satisfaction.

Methods: A cross sectional study involved all medical laboratory professionals in eight hospitals in Oman from different geographical areas. A survey instrument measuring job satisfaction was developed from the result of earlier qualitative studies done by the authors in the population of 101 participants. In addition, job stress was assessed using a survey based on the Nurse Stress Index (NSI).

Results: The results show a significant statistical association between stress and job satisfaction. Omanis have significantly higher stress scores compared to non-Omani citizens. The youngest MLPs at Omani Hospitals were less satisfied at work and more stressed than their older colleagues. Job satisfaction was lower and job stress higher in the Sultan Qaboos University Hospital than in all the other hospitals. The most important dissatisfaction factors, leading to job stress, are insufficient support for professional development, poor relations with supervisors and co-workers, as well as heavy workload.

Conclusion: This study emphasizes the importance of investing in measures to meet the expectations of laboratory staff, to strengthen factors that increase satisfaction and eliminate dissatisfaction factors. It gives concrete advice on what those measures should be and, consequently, guides actions on improving the work environment in medical laboratories. When implemented those would reduce job stress among medical laboratory professionals in Oman, and, possibly, more widely.

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1. Introduction

A highly motivated staff is essential to ensure a high quality and efficient service in healthcare organizations. Motivation of health care workers can initiate them to exert and maintain an effort towards organizational goals. Motivation among professional staff is dependent on the following factors: achievement, recognition for achievement, the work itself, responsibility, and professional growth or advancement [1,2]. A person with high motivation is more likely satisfied with her or his work [3]. Job dissatisfaction, on the other hand, can induce work-related stress [4]. However, satisfied employees have positive perceptions towards their organizations and are more efficient at work [5].

Consequently, it is important to pay attention to job satisfaction in all organizations including health care providers as it has an effect on the quality of the service [6]. High job satisfaction leads to employees being more productive and providing a higher service quality [7].

Healthcare staff, including medical laboratory professionals, may not contribute to a positive patient experience if their own needs are not met. Therefore, it is the task of healthcare managers to ensure satisfaction among their staff [8].

Despite its obvious importance job, satisfaction has not been investigated in all professional groups in healthcare. Most previous studies have focused on nurses [9] and few are from low or middle-income countries.

A study from Africa showed that low salaries, lack of promotion, training and development, strained relations with supervisors, poor working conditions and unjust organizational policies were the main factors for job dissatisfaction among healthcare staff [10].

Demographic factors like gender, age, education level, designation, marital status and work conditions such as salary and shift work are also related to job satisfaction [11].

Stress at work is a physical and emotional reaction when the job requirements do not meet the capabilities of the worker [12]. Stress can also be caused by job dissatisfaction, which leads to poor performance. Therefore, it is important to define the cause for dissatisfaction to reduce work-induced stress, all the more as this, as pointed out above, has a negative impact on the quality of healthcare services [13].

The relationship between stress and job satisfaction is well recognized. Salary, workload, health and safety, lack of recognition, training development, and lack of decision-making are dissatisfaction factors that lead to stress [14]. Stress at work were reported among hospital nurses in Iran, which led to medical incidents and was found to relate to job satisfaction, which in turn affected the level of turnover and lower retention rate, and ultimately work performance [15].

The safety of workers plays an important role for the productivity caused by concerns of shift work duties as reported by Khammar et al., 2017 [16].

The Canadian Community Health Survey reported that medical laboratory technicians were one of the healthcare worker groups experiencing high job stress [17]. Another study showed that a high workload lead to dissatisfaction among medical laboratory personnel [18].

A study established that actions need to be taken to improve the level of motivation among medical laboratories to promote a good quality of the healthcare service [19].

In summary, there is limited previous research on to what extent job stress is associated with job satisfaction and especially among medical laboratory professionals, above all in countries in the Middle East, including Oman.

However, in our previous study among Omani medical laboratory professionals, based on interviews, the following major issues were associated with job satisfaction: workload felt suitable, autonomy, professional status, salary, professional development, the relations with co-workers and head of departments, health and safety, organizational policies, stress, and job security (for non-Omanis). We will in the following refer to those as factors of job satisfaction. The factors associated with dissatisfaction were high workload, lack of health safety, unfair promotion system, lack of training opportunities, poor relationships with the leaders, and non-rewarding organizational policies. All of these latter factors contributed to higher levels of stress [20].

The aim of this study is to analyze whether those views on job satisfaction are more widely shared by medical laboratory professionals (MLPs) in Omani hospitals. It assesses differences in job satisfaction, overall and by component, and job stress between age groups, gender, nationalities, and seniority and salary strata. In addition, it aims at quantifying possible correlations between job stress and job satisfaction, overall and by factor.

2. Methods

2.1. Study design

This is a cross-sectional study directed at all MLPs in the eight Omani hospitals, with 336 responding, applying a survey instrument measuring job satisfaction developed from results of qualitative studies in the same population [20,21]. In addition, job stress was assessed using a survey based on the Nurse Stress Index [22]. To measure the importance of each job satisfaction factor identified in the previous study, a proposition was constructed and a response as to agreement was measured with a five-point Likert scale (strongly disagree = 1, disagree = 2, neutral = 3, agree = 4, strongly agree = 5). As to job stress, the Nurse Stress Index [22] was used, with responses measured on a four-point Likert scale. All medical laboratory scientists in the eight hospitals were invited to participate in the survey. The hospitals (eight out of 51) were selected to represent all parts of the country.

Before distributing the survey questionnaire, a pilot study was performed at the Sultan Qaboos University Hospital among 10 MLPs chosen randomly (being senior, junior and chief analysts) and who were not to be included in the main study. The researcher discussed

the questionnaire with them to ensure that the questions were understandable. Four questions were felt to be unclear and were removed.

These informants suggested that the questionnaire should be distributed and collected by the researcher in person, and not through the hospital administration, because of the sensitivity of the subject and to uphold confidentiality. The average time taken by the participants to complete the questionnaires was 20–30 min.

A panel of experts at the Sultan Qaboos University Hospital and the College of Medicine, representing medical laboratories, psychology, social sciences and biostatistics, reviewed the content validity of the job satisfaction questionnaire of this study. These experts concluded that, as all themes from our focus group discussions (FGDs), performed among medical laboratory professionals in the same hospitals where the survey was to be distributed, are found as items (factors) of the questionnaire, all-important aspects of job satisfaction in that context were covered, meeting the criteria of content validity. As a measure of internal consistency, we calculated Cronbach's Alpha. It was 0.89 for the job satisfaction questionnaire and 0.87 for the job stress questionnaire with an overall value of 0.92. These values indicate that the questionnaire is statistically reliable. We combined both instruments into one questionnaire form, and added an initial part seeking information on age, gender, nationality, years of experiences, shift pattern, department, marital status, family location, and education level (Questionnaire Part 1).

Part 2 of the questionnaire measured job satisfaction. For twenty-nine items the participants were asked to rate their level of satisfaction in eight areas (factors), characterizing their work arrangements and environment: pay and promotion, autonomy, health and safety, professional status, workload, professional development, organization policies, and relationships with co-workers and leaders. The questions were distributed randomly in the questionnaire.

Part 3 of the questionnaire measured experienced job stress in the six areas adapted from the Nurse Stress Index (NSI) [22], which were presented as coping with workload, organizational support, blood sampling, working environment, home/work discordance, and confidence/proficiency at work. Seventeen questions were randomly distributed to be answered on a four-point Likert scale ranging from "not at all stressful" to "extremely stressful."

The questionnaire is exhibited in full in [Appendix I](#).

Table 1
Comparison of mean scores and SDs for job stress and job satisfaction by sociodemographic characteristics.

Demographic characteristics		Job Satisfaction			Job stress		
		Mean	SD	P value	Mean	SD	P value
Age	<25	95.00	±10.322	<0.05	30.58	±14.969	<0.05
	25–34	91.40	±16.193		30.24	±11.829	
	35–44	97.03	±17.374		26.46	±10.740	
	45–54	104.87	±13.582		23.51	±11.555	
	>54	109.20	±17.126		17.80	±7.084	
Gender	Male	100.45	±15.123	<0.05	24.57	±10.811	0.001
	Female	93.52	±17.327		29.20	±11.942	
Marital status	Single	96.77	±12.774	>0.05	28.17	±11.023	>0.05
	Married	95.85	±17.851		27.49	±12.008	
	Divorced	91.50	±11.269		26.50	±7.594	
Nationality	Omani	88.22	±15.507	<0.05	32.35	±11.139	<0.05
	Non-Omani	105.95	±12.824		21.43	±9.448	
Shift Pattern	One shift	93.97	±15.840	<0.05	27.32	±10.651	>0.05
	Two shifts	96.60	±15.455		29.57	±11.904	
	Three shifts	98.04	±17.961		27.09	±12.509	
	Others	87.69	±13.130		32.54	±10.381	
Salary	800–1100	97.92	±16.569	0.004	25.86	±11.944	0.001
	1200–1500	93.90	±17.310		28.76	±10.667	
	1600–2000	86.04	±15.126		34.56	±11.332	
	2100–2400	94.67	±14.304		35.42	±8.240	
Highest degree	>2400	107.40	±9.607	>0.05	27.40	±10.877	>0.05
	Diploma	92.37	±16.387		28.49	±12.018	
	B.Sc	97.76	±15.994		26.62	±11.573	
	Masters	91.85	±19.320		30.34	±12.333	
	Ph.D	111.00	±8.485		27.50	±2.121	
Specialty	Others	98.50	±7.778	>0.05	21.00	±7.071	>0.05
	Hematology	95.68	±29.46		29.46	±11.390	
	Pathology	96.52	±25.94		25.94	±9.967	
	Biochemistry	96.27	±28.66		28.66	±13.332	
	Microbiology	93.15	±29.28		29.28	±11.124	
Designation	Genetics	89.00	±23.38	>0.05	23.38	±6.239	>0.05
	General medical lab sciences	99.05	±26.38		26.38	±13.189	
	superintendents (supervisors)	92.36	±13.040		34.00	±6.618	
	Chief BMS	99.44	±13.290		29.83	±13.156	
	Senior BMS	94.42	±17.983		28.71	±12.180	
Junior BMS	97.29	±14.981	26.31	±10.951			

2.2. Setting and participants

The questionnaire was distributed to 539 MLPs working in the Royal Hospital, Khoula Hospital, Al Nahdha Hospital, Al Masarra Hospital, Nizwa Hospital, Ibra Hospital, Sultan Qaboos Hospital, Salalah site and Sultan Qaboos University Hospital. These hospitals are located in different geographical areas around the country.

The data were analyzed using SPSS version 27.0. Descriptive statistics were performed for demographic data, job satisfaction and stress scale scores which are presented as frequencies, means and standard deviations. The association between job stress and job satisfaction was evaluated by linear regression, considering job stress as the dependent parameter. Analysis of Variance (ANOVA) using job stress as the dependent factor analyzed the job satisfaction factors that showed negative correlations with linear regression, like Professional development, Relationship with co-workers and leaders, and Workload, for significance. The impact of demographic characteristics and the mean stress value of subjects were analyzed by using Between-Subjects ANOVA. Statistically significant impacts observed between age groups of subjects were then subjected to Post Hoc analysis using Least Significant Difference (LSD) to identify the significant differences between subgroups. The level of statistical significance was set at $p < 0.05$.

3. Results

3.1. Response rates

A total of 336 participants returned the survey. The response rates were high in Al Masarra Hospital, Nizwa Hospital, and Sultan Qaboos University Hospital (100 %, 80 %, 74 %) respectively, and moderate in Al Nahdha, Ibraa, and Sultan Qaboos Hospital, Salalah site (59 %, 59 %, 67 %). The Royal Hospital had a response rate of 40 %, the reason being that most of the staff were on study or annual leave at the time of the study. The overall response rate was 62 %.

3.2. Demographic details of the medical laboratory professionals

Sixty-four percent of the respondents were female (36 % male). As to nationality, 56.2 % were Omanis and 43.8 % non-Omanis. The biggest age group was 25–34 years of age and the smallest 54 years and older. Half of the respondents did three-shift work (50.8 %). Seventy-nine percent were married.

3.3. Levels of job satisfaction and job stress

The results are presented in the following order: mean scores of job satisfaction and job stress by different demographic groups (Table 1), by hospitals (Tables 2 and 3) and by job satisfaction and stress factors (measured by questionnaire items) (Tables 4 and 5).

Scores for job satisfaction and job stress are divided into ranges. The range 29–67 represent low satisfaction, 68–106 moderate satisfaction, and 107–145 high satisfaction. For job stress, scores 0–16 are defined as no stress, 17–34 very little stress, 35–51 moderate stress, and 52–68 extreme stress [23].

There were significant differences between age (p -levels <0.05), gender (0.05 and 0.001 respectively), nationality (0.05) and salary groups (0.004 and 0.001) as shown in Table 1.

Shift work has an impact on job satisfaction ($p < 0.05$) but not on stress. For marital status, specialty (department), qualification level and designation no significant differences in neither job satisfaction nor job stress were found.

The level of stress depends on the age group of medical laboratory scientists. The pairwise comparisons of the different age groups show that the older staff has significantly lesser stress on average compared to the younger ones ($p < 0.05$). Similarly, stress is influenced by nationality of the participants. Omani nationalities have significantly higher stress scores compared to non-Omani citizens ($p < 0.05$).

Results reported in Tables 2 and 3 show significant differences between hospitals as to both job satisfaction and job stress. Job satisfaction was lower and job stress higher in the Sultan Qaboos University Hospital than in all the other hospitals, managed by the Ministry of Health, also when calculating the latter as one group ($P < 0.05$) (Table 3).

Table 2

Comparison of job satisfaction and stress scores of the hospital.

Hospitals	Job satisfaction			Job stress		
	Mean	SD	p value	Mean	SD	p value
Nizwa Hospital	92.44	±18.809	<0.05	31.56	±12.652	<0.05
Almasarraa	102.94	±14.182		29.50	±9.438	
Ibra Hospital	102.71	±17.631		20.57	±10.804	
Royal hospital	93.46	±17.549		28.64	±12.499	
Khoula hospital	90.45	±27.666		25.71	±12.274	
SQUH	91.90	±14.640		29.66	±11.400	
Sultan Qaboos hospital (Salalah)	102.07	±14.134		23.20	±11.051	
Al Nahdha hospital	105.69	±20.946		22.00	±9.670	

Table 3
Impact of workplace on job satisfaction and job stress between the SQUH and Ministry Of Health (MOH) hospitals.

Hospitals	Job satisfaction			Job stress		
	Mean	SD		Mean	SD	
SQUH	91.90	±14.640	<0.05	29.66	±11.400	<0.05
MOH Hospitals	96.31	±20.323		26.47	±12.090	

The scores for each job satisfaction and job stress factor are displayed in Tables 4 and 5

Table 4
Mean and standard deviation of job satisfaction components.

Job satisfaction factors	Mean	SD
Pay and promotion	3.16	.80
Health and safety	2.70	.80
Organization policies	3.44	.70
Professional development	3.54	.82
Autonomy	3.34	.73
Professional status (appreciation and recognition)	3.72	.80
Relationship with coworkers	3.75	.61
Workload	3.25	.72

Table 5
Mean and standard deviation of job stress components (adapted from NSI).

Stress factors	Mean	SD
Coping with workload	2.16	1.1
Organizational support	1.52	.95
Blood Sampling	1.39	.74
Working environment	1.78	.96
Home/work discordance	1.63	1.1
Confidence of the proficiency at work	1.92	.86

For most factors, mean satisfaction scores lay within a range of 0.4; an indication that those factors are of equal importance. The highest level of satisfaction was with the relationships with co-workers and leaders and the perceived professional status. There was less satisfaction with health and safety conditions in the laboratories pay levels and promotion opportunities as well as workload.

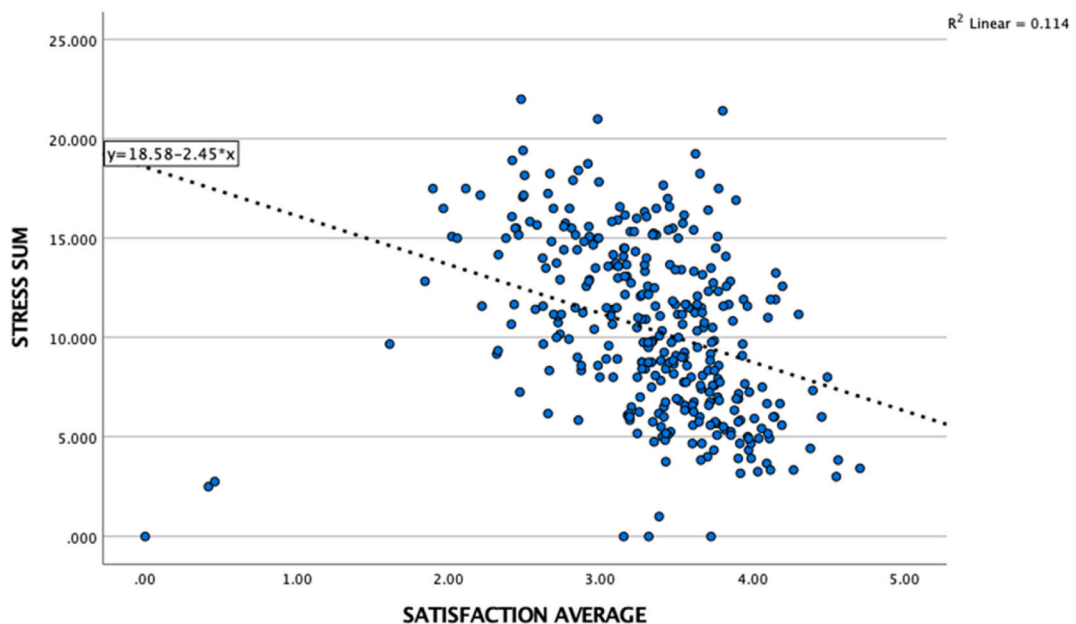


Fig. 1. Correlation between the job stress and job satisfaction of medical laboratory professionals in Omani Hospitals.

The mean scores of stress factors varied between 1.39 and 2.16 (4 being most stressful), the lowest related to blood sampling and the highest to coping with workload. Overall, those scores indicate a moderate level of stress related to each factor. Consequently, overall high stress levels might be the result of interactions of all factors.

3.4. The relationship between job stress and job satisfaction

The relationship between job stress (dependent variable) and job satisfaction and its components (independent variables) was studied by multivariate regression analysis. The negative correlation is well illustrated in the scatter plot of Fig. 1. The regression model had a good fit with an adjusted R-square of 0.345.

The relative importance of the job satisfaction components as job stressors are reported in Table 6.

The three most important job satisfaction factors, showing statistical significance that correlated to reduced stress in Omani medical laboratories are:

Professional development, relationships with co-workers and leaders, and workload. Those were also the components with highest scores when responders rated job satisfaction. The other satisfaction components were also negatively correlated to stress, although not significantly, with the exception of health and safety.

These results indicate the following: For every one unit of increase in satisfaction score for professional development, the stress sum score decreases by 1.2 units, assuming all other variables are held constant. Similarly, for every one unit of increase in score for relationship with coworkers, the stress sum score decreases by 2.1 units, assuming all other variables are held constant.

For every one unit of increase in score for workload, stress sum score decreases by 1.8 units, assuming all other variables are held constant.

4. Discussion

We found that there were significant differences in job satisfaction and stress between age groups, gender, nationalities, and salary strata. When job dissatisfaction increased higher stress, levels were reported. This is in line with what has been found among American biomedical analysts [24].

The youngest MLPs at Omani Hospitals were less satisfied at work and more stressed than their older colleagues. One reason might be high expectations that are not met in their laboratory environment in reality. Similar findings are reported from Malaysia, where younger age groups among laboratory staff are more dissatisfied [18]. Echoing this a recent study showed that Chinese physicians over 41 years of age had higher job satisfaction and lower stress than their younger peers [13]. The authors offer as an explanation that work commitment is higher among older and more experienced professionals.

Our findings show that males are more satisfied than females and feel less stress at work. Similarly, a study from a hospital reported that female doctors had significantly lower levels of satisfaction and more stress compared to their male colleagues [25]. This observation is in line with the findings of studies that have been conducted in Saudi Arabia among nurses: men had higher job satisfaction scores than women [26]. Male and female professionals might have different expectations as to work-life explaining this difference. Another possible explanation is that women have commitments that are more social in family life than men, which might make them less satisfied at work and increase their level of stress. This seems to be the case in the Omani context.

The non-Omani MLPs are more satisfied and report less stress than Omanis. One possible reason is that Omanis are residents with families, and thus have more social commitments than ex-patriates living alone. In our focus group interviews preceding this survey study, expectations of Omani staff as to professional development were high but were not met [20]. Non-Omanis expected less from their work but felt that they got more than expected, and therefore, reported higher levels of job satisfaction. Most non-Omanis were older than the average and adapted more easily to the working environment of the laboratories. The same observation was made among nurses in Saudi Arabia, where non-Saudi nurses had higher satisfaction scores than Saudi nurses. The possible explanation for this finding is that Saudi nurses may, as Omani MLPs, have high but not met expectations at work. In addition, the female nursing profession is not held in high esteem in Saudi Arabia [26].

It comes as no surprise that MLPs earning more than 2400 Omani Rials were more satisfied and less stressed at work than lower paid colleagues. This group included managers and senior staff who were committed to improve the work environment. The same finding was reported from Pakistan: good pay will reduce stress [27]. In addition, a parallel study among physicians in Oman reported that lower income was the main reason for lack of satisfaction [28].

Table 6
Job satisfaction components correlated to stress.

Job satisfaction factors	B	Std. Error	t-test	t
Pay and promotion	-.48	.36	-1.34	.18
Health and safety	.17	.31	.55	.59
Organization policies	-.65	.43	-1.51	.13
Professional development	-1.24	.34	-3.65	.00
Autonomy	-.01	.34	-.02	.99
Professional status (appreciation & recognition)	-.29	.38	-.79	.43
Relationship with co-workers and leaders	-2.15	.47	-4.62	.00
The Workload	-1.9	.37	-5.12	.00

Job dissatisfaction factors catalyze increasing levels of stress at work. That has an effect on the quality of health services, which was shown for healthcare staff including MLPs in Saudi hospitals [29].

The most important job satisfaction factors in the Omani laboratories were, as found in this study, relationships with co-workers and leaders, and professional status (shown as recognition and appreciation). On the other hand, dissatisfaction factors were lacks in health and safety, low pay and slow career progress, as well as heavy workload.

Lack of health and safety in the laboratories was also a source of dissatisfaction, corresponding to findings in a study conducted in Malaysia and Iran among MLPs, where inadequate laboratory safety was one of the main sources of dissatisfaction at work [18].

A study in Kenya reported that 49.5 % of laboratory personnel suffered from dangerously placed equipment and chemical hazards in the laboratories, emphasizing the importance of adequate and safe working conditions [30].

The most important factor also causing dissatisfaction among MLPs in our study was workload. To have to cope with a heavy workload is an important stress factor. This finding is consistent with the results of a previous study conducted in Saudi Arabia among healthcare workers in primary health care centers [29].

Constructive relationships with co-workers and appreciation shown by management contributed to overall job satisfaction. On the other hand, perceived low professional status and poor recognition in the Sultan Qaboos University Hospital in Oman was a major dissatisfaction factor among MLPs employed there [31]. However, a study from Ethiopia showed that MLPs were more satisfied with relationships at work than other healthcare professionals [32].

Finally, MLPs at Sultan Qaboos University Hospital were less satisfied and had higher stress levels than colleagues at the Ministry of Health hospitals. A possible explanation is that the university hospital MLPs have higher expectations of recognition as they contribute, in addition to routine work, to teaching MLP and medical students, and felt that those were not met.

4.1. Methodological consideration

The quantitative analysis of work satisfaction and job stress was based on a questionnaire, designed from the results of the qualitative analysis of FGD data. The advantage of this approach was that statements from representatives of the target group on issues of relevance to them could be used. The content validity of these propositions and their underlying satisfaction items was found satisfactory. However, a further scrutiny of the psychometric qualities of the questionnaire was not performed, which is a weakness. The job stress questionnaire was based on a validated and widely used stress measurement instrument. The combined survey instrument was found to have an acceptable statistical reliability.

One strength of the study was that the survey covered all MLPs in a geographically representative sample of all hospitals in Oman and that it had an acceptable overall response rate. However, it was cross-sectional representing the views of the participants at one point in time. As circumstances alter people might change their minds limiting the relevance of the results over time. It is also important to emphasize that the results reported demonstrate statistical associations and do not enable causal explanations.

The study was justified by the lack of studies in medical laboratories in Oman. As such the study presents empirical results on sources of dissatisfaction and stress that might be useful to managers in Omani hospitals. However, they cannot be generalised to other healthcare institutions or countries. On the other hand, to the extent that these results are in line with observations elsewhere they can be interpreted as confirming more general views on factors contributing to job satisfaction, dissatisfaction and job stress.

4.2. Implications for future researches

According to our study, Herzberg's two-factor theory of motivation appears to be a relevant framework for studies on job satisfaction among healthcare professionals, including medical laboratory scientists. In addition, satisfiers and hygiene factors can be used to guide both qualitative and quantitative studies on job satisfaction in healthcare, but factor labels and the descriptions of those should be adjusted to mirror the organisational context.

5. Conclusions

There is a correlation between job satisfaction and job stress, overall and by factor, among medical laboratory professionals in Oman. These findings are corroborated by studies performed elsewhere, especially in the Mid-east and Africa. In many of those countries ex-patriates form an important part of the workforce, and they are, by and large, more satisfied than residents. More experienced and senior staff show higher levels of satisfaction also. Gender and salary levels are also of importance.

The most important dissatisfaction factor among medical laboratory professionals is health and safety in the laboratories. The satisfaction components with highest scores were professional status and relationships with co-workers and leaders.

The most important dissatisfaction factors, leading to job stress, are insufficient support for professional development, poor relations with supervisors and co-workers, as well as heavy workload.

This study emphasizes the importance of investing in measures to meet the expectations of laboratory staff, to strengthen factors that increase satisfaction and eliminate dissatisfaction factors. It gives concrete advice on what those measures should be and, consequently, guides actions on improving the work environment in medical laboratories.

Ethics approval and consent to participate

Personal integrity was guaranteed. Participation was voluntary, and informed consent was obtained from all the participants after

fully disclosing the purpose of the study. Data storage and handling complied with the requirements of Swedish legislation on research ethics and personal data. The Research and Ethical Review and Approval Committee of the Omani Ministry of Health (MH/DGP/R&S/PROPOSAL, 2016) and the Ethics Committee at the College of Medicine and Health Sciences at the Sultan Qaboos University Hospital (MREC # 1151) approved the study.

Consent for publication

Not applicable.

Data availability

All data are available from the first author on reasonable request. **Competing interests.**
The authors declare No conflict of interest.

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CRediT authorship contribution statement

Samira Alrawahi: Alrawahi, Writing – review & editing, Writing – original draft, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Stina Fransson Sellgren:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Salem Altouby:** Supervision, Data curation. **Nasar Alwahaibi:** Supervision, Methodology, Data curation. **Mats Brommels:** Writing – review & editing, Supervision, Project administration, Methodology, Formal analysis, Data curation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix I

Part I

Personal background

This part has 13 questions related to your sociodemographic characteristics.
Please put a (✓) in the appropriate box AND fill some boxes.

1 Age (years)

1. <25
2. 25-34
3. 35-44
4. 45-54
5. >54

2 Gender

1. Male
2. Female

3 Nationality:

1. Omani
2. Non-Omani

- 4 Marital Status:
1. Single
 2. Married
 3. Divorced
- 5 Your family (**for non-Omani only**) is:
1. In Oman (with you)
 2. In your country
- 6 How much is your monthly salary?
1. 800-1100 OMR
 2. 1200-1500 OMR
 3. 1600-2000 OMR
 4. 2100-2400 OMR
 5. >2400
- 7 What is your main specialty (or department)
1. Hematology
 2. Pathology
 3. Biochemistry
 4. Microbiology
 5. Genetics
 6. General Medical Laboratory Sciences
- 8 What is your designation (post)?
1. Superintendent (Supervisor for Ministry Of Health Hospitals)
 2. Chief BMS
 3. Senior BMS
 4. Junior BMS
- 9 What is your highest degree or qualification?
1. Diploma (or equivalent)
 2. BSc
 3. Masters
 4. PhD
 5. Othersplease specify
- 10 How long have you been working in your current post?
- Years/Months
- 11 Your total work experience in years is:
-
- 12 What is the total number of years you have worked as a medical laboratory technologist in Oman? (**for expatriates only**)
-
- 13 Do you serve shift pattern of:
1. One shift
 2. Two shift
 3. three shift
 4. More than one shift

Part II

Job satisfaction

Instructions. In this part of the questionnaire, there are some aspects of your job which you may strongly disagree, disagree, neither disagree nor agree, agree or strongly agree. Please put a (✓) in the appropriate box.

Statements	(1) Strongly disagree	(2) disagree	(3) Neither disagree nor agree	(4) Agree	(5) Strongly agree
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					

Part III

Job stressors

Instructions. Please read the following and answer whether or not they are extremely stressful, moderately stressful, minimally stressful, and not at all stressful.

Please put a (✓) in the appropriate box.

Stressors	(1) Not at all stressful	(2) Minimally stressful	(3) Moderately stressful	(4) Extremely stressful
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

(continued on next page)

(continued)

Stressors	(1)	(2)	(3)	(4)
	Not at all stressful	Minimally stressful	Moderately stressful	Extremely stressful
13	Coping with new instrumentations for diagnostic tests.			
14	The work environment (laboratory set up, equipment, lab doctors, etc.)			
15	Unrealistic expectations by others of the same role.			
16	Taking blood samples from patients (for blood bank).			
17	Remaining alert most of the time when on call.			

References

- [1] F. Herzberg, One more time: how do you motivate employees? *Harv. Bus. Rev.* (1976) 17–32, https://doi.org/10.1007/978-1-349-02701-9_2.
- [2] S.A. Berumen, L.P. Pérez-Megino, K.A. Ibarra, Extrinsic motivation index: a new tool for managing labor productivity, *Int. J. Bus. Sci. Appl. Manag.* 11 (2016) 1–17.
- [3] C. Borzaga, E. Torita, Worker motivations, job satisfaction, and loyalty in public and nonprofit social services, *Nonprofit Volunt. Sect. Q.* 35 (2) (2006) 225–248, <https://doi.org/10.1177/0899764006287207>.
- [4] R.S. Butt, D.X. Wen, R.Y. Hussain, S. Pervaiz, Effect of job stress, benefits and salary on employee job satisfaction based on mediating and moderating role of work environment and leadership: evidence from telecom sector, *Int. J. Eng. Manag. Res.* 10 (2020) 121–230, <https://doi.org/10.31033/ijemr.10.3.19>.
- [5] I.P. Adamopoulos, N.F. Syrou, Associations and correlations of job stress, job satisfaction and burn out in public health sector, *Eur. J. Environ. Public Health.* 6 (2022) em0113, <https://doi.org/10.21601/ejeph/12166>.
- [6] D. Khadka, N. Chaulagain, Factors influencing job satisfaction among healthcare professionals at Tilganga eye centre, Nepal, *Int. J. Sci. Technol. Res.* 1 (2018) 32–36.
- [7] W.K. Aruasa, L.K. Chirchir, S.K. Chebon, Determinants of physicians and nurses' professional satisfaction at the moi teaching and Referral Hospital, Eldoret, Kenya, *J Health Med. Nurs.* 64 (2019) 6–17.
- [8] C.A. Cox, Nurse manager job satisfaction and retention: a home healthcare perspective, *Nurs. Manag.* 50 (2019) 16–23, <https://doi.org/10.1097/01.NUMA.0000558512.58455.68>.
- [9] M.I. Abdullah, D. Huang, M. Sarfraz, L. Ivascu, A. Riaz, Effects of internal service quality on nurses' job satisfaction, commitment and performance: mediating role of employee well-being, *Nurs Open* 8 (2021) 607–619, <https://doi.org/10.1002/nop2.665>.
- [10] H.K. Abate, C.K. Mekonnen, Job Job satisfaction and associated factors among health care professionals working in public health facilities in Ethiopia: a systematic review, *J. Multidiscip. Healthc.* 14 (2021) 821–830, <https://doi.org/10.2147/JMDH.S300118>.
- [11] K. Li, H. Chen, Z. Tan, X. Yin, Y. Gong, N. Jiang, F. Yang, Job satisfaction and its related factors among emergency department physicians in China, *Front. Public Health* 10 (2022) 925686, <https://doi.org/10.3389/fpubh.2022.925686>.
- [12] W. Winar, R. Kusumapradja, M.R. Hilmy, S.T. Arief, How job stress can improve job satisfaction nurse, in: *Proceedings of the 1st International Conference on Recent Innovations*, 2018, p. 2802, <https://doi.org/10.5220/0009952928022807>. –2807.
- [13] M. Birhanu, B. Gebrekidan, G. Tesefia, M. Tareke, Workload determines workplace stress among health professionals working in Felege-Hiwot referral hospital, Bahir Dar, Northwest Ethiopia, *J. Environ. Public Health.* 2018 (2018) 6286010, <https://doi.org/10.1155/2018/6286010>.
- [14] O.G. Baker, B.D. Alshehri, The relationship between job stress and job satisfaction among saudi nurses: a cross-sectional study, *Nurse Media J. Nurs.* 10 (2020) 292–305, <https://doi.org/10.14710/nmjn.v10i3.32767>.
- [15] M. Poursadeghiyan, M. Abbasi, A. Mehri, M. Hami, M. Raei, M.H. Ebrahimi, Relationship between job stress and Anxiety, depression and job satisfaction in nurses in Iran, *The SocialSciences* 11 (2016) 2349–2355. <https://www.researchgate.net/publication/311351564>.
- [16] A. Khammar, M. Moghimia, M.H. Ebrahimi, M. Abbasi, M.M. Baneshi, A.R. Yari, M. Hami, M. Poursadeghiyan, Effect of bright light shock on sleepiness and adaptation among night workers of a hospital in Iran, *Ann. Trop. Med. Publ. Health* 10 (2017) 595–599, <https://doi.org/10.4103/ATMPHATMPH.108.17>.
- [17] B. Gohar, B. Nowrouzi-Kia, The forgotten (invisible) healthcare heroes: experiences of Canadian medical laboratory employees working during the pandemic, *Front. Psychiatry.* 13 (2022) 854507, <https://doi.org/10.3389/fpsy.2022.854507>.
- [18] N. Fadaei, H. Zainuddin, S.S. Hassan, Job dissatisfaction and its related factors among laboratory staff, *Iran J. Public Health* 43 (2014) 142–147.
- [19] A. Al-Qathmi, H. Zedan, The effect of incentive management system on turnover rate, job satisfaction and motivation of medical laboratory technologists, *Health Serv. Res. Manag Epidemiol.* 8 (2021) 2333392820988404, <https://doi.org/10.1177/2333392820988404>.
- [20] S. Alrawahi, S.F. Sellgren, N. Alwahaibi, S. Altouby, M. Brommels, Factors affecting job satisfaction among medical laboratory technologists in University Hospital, Oman: an exploratory study, *Int. J. Health Plan. Manag.* 34 (2018) e763–e775, <https://doi.org/10.1002/hpm.2689>.
- [21] S. Alrawahi, S.F. Sellgren, S. Altouby, N. Alwahaibi, M. Brommels, The application of Herzberg's two-factor theory of motivation to job satisfaction in clinical laboratories in Omani hospitals, *Heliyon* 6 (2020) e04829, <https://doi.org/10.1016/j.heliyon.2020.e04829>.
- [22] P.E. Harris, The nurse stress index, *Work. Stress* 3 (1989) 335–346, <https://doi.org/10.1080/02678378908256952>.
- [23] H. Safarpour, S. Sabzevari, A. Delpisheh, A study on the occupational stress, job satisfaction and job performance among hospital nurses in Ilam, Iran, *J. Clin. Diagn. Res.* 12 (2018) JC01–JC05, <https://doi.org/10.7860/JCDR/2018/27410.11573>.
- [24] E. Garcia, I. Kundu, M. Kelly, R. Soles, L. Mulder, G.A. Talmon, The American society for clinical pathology's job satisfaction, well-being, and burnout survey of laboratory professionals, *Am. J. Clin. Pathol.* 153 (2020) 470–486, <https://doi.org/10.1093/ajcp/aqaa010>.
- [25] B. Coplan, T.C. McCall, N. Smith, V.L. Gellert, A.C. Essary, Burnout, job satisfaction, and stress levels of PAs, *J. Am. Acad. Physician Assist.* 31 (2018) 42–46, <https://doi.org/10.1097/01.JAA.0000544305.38577.84>.
- [26] H.I. Al-Haroon, M.F. Al-Qahtani, The demographic predictors of job satisfaction among the nurses of a major public hospital in KSA, *J. Taibah Univ. Med. Sci.* 15 (2020) 32–38, <https://doi.org/10.1016/j.jtumed.2019.11.003>.
- [27] R.Q. Danish, U. Draz, H.Y. Ali, Impact of organizational climate on job satisfaction and organizational commitment in education sector of Pakistan, *Am. J. Mob. Syst. Appl. Serv.* 1 (2015) 102–109.
- [28] I.A. Burney, S.D. Al Sabei, O. Al-Rawajfah, L.J. Labrague, R. AbuAlrub, Determinants of physicians' job satisfaction: a national multi-centre study from the Sultanate of Oman, *Sultan Qaboos Univ. Med. J.* 1 (1) (2022), <https://doi.org/10.18295/squmj.8.2022.050>.
- [29] L.A. Halawani, M.A. Halawani, G.M. Beyari, Job satisfaction among Saudi healthcare workers and its impact on the quality of health services, *J. Fam. Med. Prim. Care* 10 (2021) 1873–1881, <https://doi.org/10.4103/jfmpc.jfmpc.2236.20>.
- [30] F.N. Muriuki, C. Mburu, J. Gikunju, Occupational safety and health status of medical laboratories in Kajiado County, Kenya, *Pan. Afr. Med. J.* 29 (2018) 65, <https://doi.org/10.11604/pamj.2018.29.65.12578>.
- [31] S. Alrawahi, S.F. Sellgren, S. Altouby, N. Alwahaibi, M. Brommels, The application of Herzberg's two-factor theory of motivation to job satisfaction in clinical laboratories in Omani Hospitals, *Heliyon* 6 (9) (2020), <https://doi.org/10.1016/j.heliyon.2020.e04829>.
- [32] K. Temesgen, M.W. Aycheh, C.T. Leshargie, Job satisfaction and associated factors among health professionals working at Western Amhara Region, Ethiopia, *Health Qual. Life Outcomes* 16 (2018) 65, <https://doi.org/10.1186/s12955-018-0898-7>.