International Journal of Arts, Sciences and Education
Volume 2 Issue 1 | December 2021
ISSN: 2799 - 1091
Page No. 32-50

LEVEL OF WORK-RELATED STRESS OF MEDICAL TECHNOLOGISTS IN PAMPANGA, BULACAN, BATAAN AND TARLAC DURING THE COVID-19 PANDEMIC

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Abstract: Work-related stress is an uncommon and long-standing concern among healthcare professionals worldwide. Studies have shown that this has worsened during the COVID-19 Pandemic and can directly affect the quality of healthcare delivery. Although numerous studies are continuously being published regarding this matter, only a few include medical technologists. Hence, this descriptive and correlational quantitative study is aimed at determining the most prevalent level of work-related stress of medical technologists in Pampanga, Bulacan, Bataan and Tarlac during the COVID-19 Pandemic, and its association with their demographic characteristics and handling of COVID-19 cases. Upon receipt of ethical clearance, data collection was conducted for three weeks. In determining the level of work-related stress, the study used a survey questionnaire developed by the Indian Council of Medical Research (ICMR). A total of 227 respondents were surveyed through Google Forms using snowball sampling technique. Subsequently, descriptive statistics, Spearman's rank-order correlation and Chi-square test of independence (CI=95%, p=<0.05) were utilized for data analysis. Results showed that the majority of the respondents have a moderate level of work-related stress (66.52%). Furthermore, it was shown that stress at work is not significantly affected by the demographic characteristics of the respondents. However, results from the Chi-square test of independence revealed that it is significantly associated with the handling of COVID-19 tests and/or patients (p=0.0291). Because of this, the researchers recommended interventions that can be done to prevent such stress from worsening and progressing to burnout. Recognizing this problem can help prevent accidents in the laboratory and improve healthcare delivery.

Keywords: *clinical laboratory, COVID-19, medical technologists, work-related stress*

I. INTRODUCTION

Every professional worldwide experience work-related stress in various forms. In particular, healthcare professionals were considered as highly vulnerable to this due to the nature of their work [1]. Various studies regarding this problem are continuously being published in medical literatures worldwide, mostly involving nurses and physicians, presenting increased levels of work-related stress [2,3], and eventually showing symptoms of burnout and mental health problems [4]. For instance, a cross-sectional study conducted in Iran showed that more than half of the surveyed healthcare professionals showed high levels of work-related stress, where majority experienced emotional exhaustion and depersonalization [5]. The occurrence of this phenomenon,

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throughout time, further affected the quality of healthcare delivery and increase in hospital accidents leading to injuries [6].

The emergence of the COVID-19 Pandemic was statistically associated with the prevalence of higher levels of work-related stress, particularly among healthcare professionals [7]. Medical technologists, who are responsible in performing diagnostic testing to detect the presence of SARS-CoV-2 in a patient sample, are also not exempted in this problem. In fact, a study involving the registered members of the American Society for Clinical Pathology found that, although there was a high job satisfaction, work-related stress was still very prevalent [8]. As identified by that study, certain factors such as understaffing, huge workload, little control on work schedules, contributed to this phenomenon, which prompted them to consider changing their career paths.

While considered to be a vital part of the healthcare team, available literatures on medical technologists worldwide, particularly on the topic of work-related stress and their wellbeing, are still inadequate [9]. Specifically in the Philippines, the medical technology profession was considered to be among the top four healthcare profession in the country, alongside physicians, nurses, and midwives [10]. However, until the time of writing, published literatures regarding the said professionals were still hardly available.

Given the abovementioned problems, the research study generally focused at determining the level of work-related stress of medical technologists during the COVID-19 Pandemic, particularly around Pampanga, Bulacan, Bataan, and Tarlac, Philippines. Specifically, it was aimed to determine the most prevalent level of work-related stress, and its correlation with the demographic characteristics of the respondents and handling of COVID-19 cases. The study was conducted with observance of the Person-Environment Fit Theory [11]. The conceptual framework of the study can be found below, under Figure 1.

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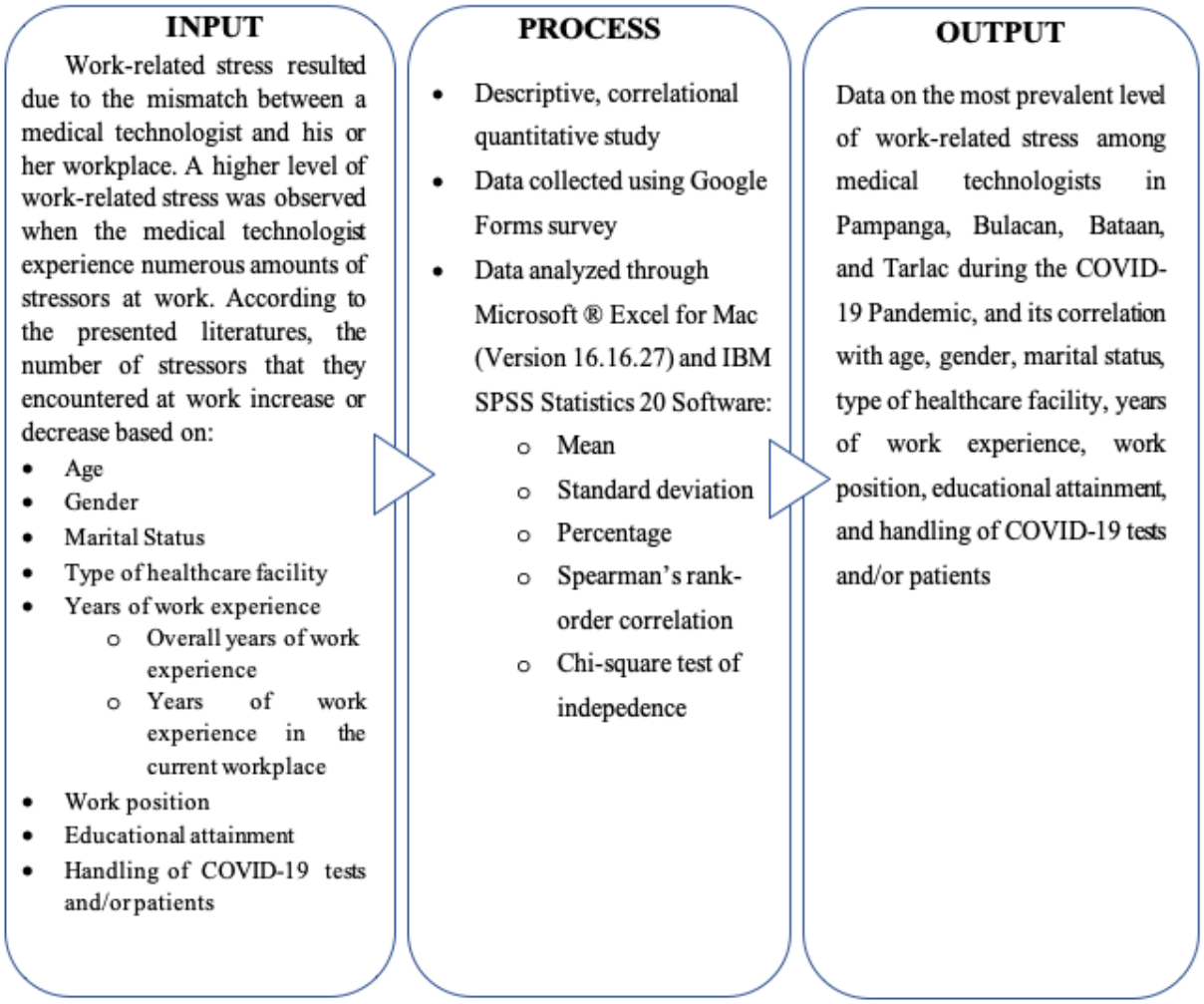

Figure 1. Conceptual Framework of the Study Based on the Person-Environment Fit Theory

II. METHODOLOGY

Research Design

The study adopted a quantitative nature of analysis. It was the preferred research design since the study utilized a survey questionnaire and the obtained data was processed using various statistical methods. Furthermore, the study adopted both descriptive and correlational types of quantitative research. Specifically, the former was utilized to answer the study's first objective – to identify the most prevalent level of stress being felt by medical technologists at work. A correlational design, on the other hand, was also adopted to assess the presence of a substantial correlation between work-related stress and the respondents' demographic characteristics and their handling of COVID-19 tests and/or patients, which are the second and last objective of the study.

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Sample and Study Site

To observe strict health and safety measures being implemented by the Philippine Government during the COVID-19 Pandemic, the data collection was conducted online. Laboratories considered in the study are primary, secondary, and tertiary laboratories. In choosing the respondents, the study made use of an inclusion criteria. Firstly, the respondent must be a registered medical technologist with unexpired license and is practicing the profession within Pampanga, Bulacan, Bataan, and Tarlac, Philippines during the COVID-19 Pandemic. Secondly, the respondent must 21 to 59 years old and has a valid and active email address.

Based on The Philippines Health System of the World Health Organization, the total population of medical technologists in the Philippines as of December 31, 2017 is 13,413 [12]. 1,345 (10.03%) of these work in either public or private laboratories within Pampanga, Bulacan, Bataan, and Tarlac. This reference was used since no other latest and reliable data was publicly available on the internet. Using the Raosoft Sample Size Calculator, the minimum recommended sample size for the study is 223 respondents, set with a 95% confidence level, 6% margin of error, and 50% response distribution from the total population. While observing the abovementioned inclusion criteria, the recruitment of the respondents was carried out using snowball sampling technique as it is the most accessible type of sampling method that permitted the recruitment of more respondents during the COVID-19 Pandemic

Data Instrumentation

In collecting the data needed for the current study, an online survey using Google Forms was utilized. The survey form was composed of two major parts: demographic profile and the respondent's level of stress at work. For the former part, checklists were used to obtain information about the age, gender, marital status, type of health facility, overall years of work experience as a medical technologist, years of work as a medical technologist in the current workplace, work position in the clinical laboratory, educational attainment, and if they have handled COVID-19 cases or not. The second part of the survey form made use of a 4-point Likert Scale, with responses being Never, Sometimes, Frequently, and Always. Since the instrument was composed of certain questions that may be sensitive for the mental health of the respondents, an option of I'd rather not answer this question was also included.

The questions from the second part of the survey form were lifted from the 32-item questionnaire that was developed by the Indian Council of Medical Research (ICMR) [13]. A letter of permission to use the survey questionnaire was sent to the author prior to use. Additionally, statements indicated in the research instrument were mostly psychological stressors, whereas some refer to physical stressors and psychosocial stressors. Together with the survey form, an informed consent was also provided in accordance with the ethics of research. The informed consent was composed of several parts namely, objectives of the study, procedure of data collection, compensation, benefits, and risks of the participating in the study, voluntariness of the respondents, and confidentiality of the obtained data. In addition, the contact information of one of the researchers was also included for additional queries regarding the survey form or the study itself.

Both the survey questionnaire and the informed consent were expressed in English and Filipino versions, where the latter were subjected to validation by a Filipino teacher to ensure that the

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translations were correct. Prior to use, a pilot test involving 27 respondents was also done to ensure the smoothness and reliability of the survey questionnaire.

Data Gathering Procedure

A letter of communication was sent via email to certain contact persons who agreed to help the researchers during data collection. For instance, in one of the hospitals that was surveyed, the researchers sent a letter of communication asking for permission to conduct data collection in the said facility. Afterward, the email addresses of the medical technologists were asked for dissemination of the survey form. After receiving the ethical clearance, the researchers began sending the survey questionnaires privately.

Upon completion of the survey form, snowball sampling technique was used to search for more respondents. In this method, qualified respondents, referred to by other respondents, and were asked for their email addresses to privately receive the survey questionnaire. This process continued until the recommended sample size was reached. The approximate duration in answering the survey questionnaire was between 10-15 minutes, inclusive of the time needed to finish reading the attached informed consent. After reaching the target sample size, data analysis was subsequently performed.

Ethical Consideration

The current study underwent ethical review by the University of Santo Tomas, Faculty of Pharmacy Review Ethics Committee (UST FOPREC). After gaining approval from the ethics committee, the researchers started the data collection by informing the respondents that the survey questionnaire was approved for dissemination. The data collection was done entirely voluntary for all qualified respondents. Should the respondents chose to withdraw from the study, they are permitted to do so, without inflicting any harm to their relationship with the researchers.

The researchers were also entitled to ensure that the responses obtained were treated with utmost confidentiality. This was done in accordance with Republic Act 10173, otherwise known as the "Data Privacy Act of 2012", where access was strictly limited to the researchers only for the sole purpose of the study. Furthermore, the answered questionnaires, especially those that contain any identifying information about the respondent, were stored in a protected and separated file, where only the researchers have access. To ensure the systematic process of data collection and management, designated identification codes were assigned for each participant. In relation to this, no information, or answers by any of the respondents were divulged outside of the grounds of the study. Lastly, the names of the respondents were not mentioned in the whole research paper, especially under the Results and Discussions.

Data Analysis

The obtained data were processed to determine the level of stress of the respondents in their workplace. In doing this, Microsoft ® Excel for Mac (Version 16.16.27) was utilized to encode, organize, and clean the data prior to data analysis. Subsequently, the data were treated using the IBM SPSS Statistics 20 Software and utilized both descriptive and inferential statistics.

Descriptive statistics, particularly percentage, mean, and standard deviation, were utilized to summary express the central tendency of the data. In the study, the respondents' age, and years of

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work experience were described using mean and standard deviation, since these values are not categorized. The remaining variables were described using a frequency distribution table.

To determine the level of work-related stress of each respondent, the sum of the responses in the Likert 4-point Scale questionnaire was acquired and interpreted according to the classification indicated by the Indian Council of Medical Research [13]. A sum ranging from 32 to 64 was interpreted as experiencing a low level of work-related stress. If the respondent obtained a sum of 65 to 95, then the score was interpreted as having a moderate level of work-related stress. Lastly, a high level of work-related stress was considered when the sum ranges from 96 to 128. After all responses have been categorized according to their level of work-related stress, the data were presented using a frequency distribution table.

Afterwards, inferential statistics were performed to check for the relationship of work-related stress with the respondents' demographic characteristics and handling of COVID-19 tests and/or patients. the study employed the use of Spearman's rank-order correlation and Chi-square test of independence. For ordinal data such as the level of work-related stress, age, years of work experience and educational attainment, Spearman's rank-order correlation was performed since it is the most preferred statistical test, given that correlation was being tested against two ordinal variables. On the other hand, in determining for the presence of a correlation between the level of work-related stress which is an ordinal data, and nominal data such as the remaining variables from the respondents' demographic characteristics and handling of COVID-19 tests and/or patients, Chi-square test of independence was employed as the preferred statistical tool.

III. RESULTS

From a minimum sample size of 223, data were obtained from 227 respondents, with a survey response rate of 100%. The data were immediately encoded, organized, and cleaned using Microsoft ® Excel for Mac (Version 16.16.27). Subsequently, data analysis was conducted using descriptive and inferential statistics, as presented below.

Respondents' demographic characteristics

Table 1. Respondent's demographic characteristics

	N	%
Gender		
Male	83	36.6
Female	144	63.4
Total	227	100.0
Marital Status		
Married	34	15.0
Single	193	85.0
Total	227	100.0
Type of Healthcare Facility		
Private Hospital	108	47.6
Public Hospital	55	24.2
Free-standing Laboratory	57	25.1
Others	7	3.1

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Total	227	100.0
Work Position in the Clinical Laboratory		
Chief Medical Technologist	9	4.0
Senior Medical Technologist	45	19.8
Junior Medical Technologist	164	72.2
Others	9	4.0
Total	227	100.0
Educational Attainment		
Bachelor's Degree	226	99.6
Master's Degree	1	0.4
Doctoral Degree (PhD)	0	0.0
Total	227	100.0
Handled COVID-19 tests and/or patients during the COVID-19 Pandemic		
Yes	174	76.7
No	53	23.3
Total	227	100.0

	Mean	**SD**
Age	26.7	5.5
Overall years of work experience as a medical technologist	5.0	5.1
Years of work experience as a medical technologist in the current workplace	3.4	4.1

Table 1 displays the frequency distribution table of the demographic characteristics of the respondents specifically, gender, marital status, type of healthcare facility, work position and educational attainment. Additionally, it shows the respondents' age, overall years of work experience as medical technologists, and years of work as medical technologists in the current workplace which are all expressed in mean and standard deviation.

Level of Work-Related Stress of the Respondents

Table 2. Level of work-related stress of medical technologists in Pampanga, Bulacan, Bataan, and Tarlac during the COVID-19 Pandemic

	N	**%**
Low Level of Work-Related Stress	67	29.52
Moderate Level of Work-Related Stress	151	66.52
High Level of Work-Related Stress	9	3.96
Total	227	100.00

Table 2 display the level of work-related stress of the respondents. The results were obtained by getting the sum of the submitted responses from the second part of the survey questionnaire. Subsequently, the obtained scores were interpreted based on the classification provided by the Indian Council of Medical Research [13].A sum of 32 to 64 is interpreted as a low level of work-related stress, whereas a sum of 65 to 95 is interpreted as moderate level of work-related stress.

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Lastly, a score of 96 to 128 is interpreted as a high level of work-related stress. Both the table and the figure show that most of the respondents' scores fall within 65 to 95, showing a moderate level of work-related stress (66.52%). This was followed by the respondents having a score that falls within 32 to 64, signifying a low level of work-related stress (29.52%). Lastly, only a small portion of the respondents (3.96%) garnered a score within 96 to 128, which was interpreted as having a high level of work-related stress.

Correlation of the Level of Work-Related Stress with the Demographic Characteristics of the Respondents and Handling of COVID-19 Tests and/or Patients

Table 3. Correlation of the level of work-related stress with age, overall years of work experience as a medical technologist, years of work experience as a medical technologist in the current workplace and educational attainment

Correlation of Level of Work-Related Stress vs	Spearman r	p value*	Conclusion
Age	0.083	0.2107	Not Significant
Overall years of work experience as a medical technologist	0.021	0.7487	Not Significant
Years of work experience as a medical technologist in the current workplace	0.029	0.6596	Not Significant
Educational attainment	-0.036	0.5926	Not Significant

. p value is significant at <0.05.

Table 3 displays the correlation of the level of work-related stress with age, overall years of work experience as a medical technologist, years of work experience as a medical technologist in the current workplace and educational attainment. This table shows that the level of work-related stress of the respondents was not significantly associated with age (r=0.083, p=0.2107), overall years of work experience as a medical technologist (r=0.021, p=0.7487), years of work experience as a medical technologist in the current workplace (r=0.029, p=0.6596), and educational attainment (r=-0.036, p=0.5926). Hence, the null hypotheses regarding the correlation of the level of work-related stress with age, overall years of work experience as a medical technologist, years of work experience as a medical technologist in the current workplace, and educational attainment were all accepted since the obtained p values were beyond 0.05.'

Correlation of the Level of Work-Related Stress with Gender

Table 4. Correlation of the level of work-related stress with gender

	Low		Moderate		High		p value***	Conclusion
	n	%	n	%	n	%		
Gender*								
Male	25	30.1	55	66.3	3	3.6	-	-
Female	42	29.2	96	66.7	6	4.2		
Gender**	**Moderate to High , n, %**							
Male	25	37.3	58		36.3		0.880	Not Significant

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Female	42	62.7	102	63.75	

. row percentage
****. column percentage***
*****. p value is significant at <0.05***

Table 4 displays the correlation of the level of work-related stress with gender. This table shows that gender was not significantly correlated with their level of work-related stress. Among males, 66.3% have moderate levels of work-related stress, which was almost the same for females (66.7%). Likewise, male and female percentage showed close values for low and high level of work-related stress. Hence, the null hypothesis for the correlation of the level of work-related stress with gender was accepted since the obtained p value was greater than 0.05.

Correlation of the Level of Work-Related Stress with Marital Status

Table 5. Correlation of the level of work-related stress with marital status

	Low		Moderate		High		p value***	Conclusion
	n	%	n	%	n	%		
Marital Status*								
Married	13	38.2	21	61.8	0	0.0	-	-
Single	54	28.0	130	67.4	9	4.7		
Marital Status**	**Moderate to High , n, %**							
Married	13	19.4	21		13.1		0.2278	Not Significant
Single	54	80.6	139		86.875			

. row percentage
****. column percentage***
*****. p value is significant at <0.05***

Table 5 displays the correlation of the level of work-related stress with marital status. This table reveals that marital status did not significantly affect the level of work-related stress (p=0.2278). Among married respondents, 61.8% have moderate levels of work-related stress while none of the respondents were categorized as having a high level of work-related stress. Among single medical technologists, 67.4% have moderate levels of work-related stress while there were 4.7% who fall under a high level of stress at work. Additionally, only 28.0% of the said respondents were categorized with a low level of stress at work and 38.2% of married respondents fall under low level of work-related stress. Hence, the null hypothesis for the correlation of the level of work-related stress with marital status was accepted since the obtained p value was greater than 0.05.

Correlation of the Level of Work-Related Stress with the Type of Healthcare Facility

Table 7. Correlation of the level of work-related stress with the type of healthcare facility

	Low		Moderate		High		p value***	Conclusion
	n	%	n	%	n	%		
Type of Healthcare Facility*								
Private Hospital	26	24.1	75	69.4	7	6.5	-	-

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Public Hospital	23	41.8	31	56.4	1	1.8		
Free-standing Laboratory	15	26.3	41	71.9	1	1.8		
Others	3	42.9	4	57.1	0	0.0		
Type of Healthcare Facility**	**Moderate to High , n, %**							
Private Hospital	26	38.8	82		51.3			
Public Hospital	23	34.3	32		20.0			
Free-standing Laboratory	15	22.4	42		26.3		0.093	Not Significant
Others	3	4.5	4		2.5			

. row percentage
****. column percentage***
*****. p value is significant at <0.05***

Table 6 displays the correlation of the level of work-related stress with the type of healthcare facility. This table shows that the type of healthcare facility did not significantly affect the level of work-related stress (p=0.093). Among respondents working in private hospitals, 6.5% have a high level of work-related stress, whereas only 1.8% of the respondents in public hospitals and free-standing laboratories fall under the same category of work-related stress. Furthermore, medical technologists working in public hospitals showed that 41.8% only have low levels of work-related stress, which was slightly higher than private hospitals (24.1%) and free-standing laboratories (26.3%). Lastly, more than half (57.1%) of the respondents working in other types of healthcare facilities experienced a moderate level of work-related stress, but none was categorized under the high level of work-related stress. Hence, the null hypothesis for the correlation of the level of work-related stress with the type of healthcare facility was accepted since the obtained p value was greater than 0.05.

Correlation of the Level of Work-Related Stress with Work Position in the Clinical Laboratory

Table 8. Correlation of the level of work-related stress with work position in the clinical laboratory

	Low		**Moderate**		**High**		**p value****	**Conclusion**
	n	**%**	**n**	**%**	**n**	**%**		
Work Position in the Clinical Laboratory*								
Chief Medical Technologist	5	55.6	4	44.4	0	0.0		
Senior Medical Technologist	15	33.3	30	66.7	0	0.0		
Junior Medical Technologist	42	25.6	113	68.9	9	5.5	-	-
Others	5	55.6	4	44.4	0	0.0		
Work Position in the Clinical Laboratory**			**Moderate to High, n, %**					
Chief Medical Technologist	5	7.5	4		2.5			
Senior Medical Technologist	15	22.4	30		18.8			
Junior Medical Technologist	42	62.7	122		76.3		0.0606	Not Significant
Others	5	7.5	4		2.5			

. row percentage

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*****. column percentage***
******. p value is significant at <0.05***

Table 7 displays the correlation of the level of work-related stress with work position in the clinical laboratory. This table shows that the work position in the clinical laboratory was not significantly correlated with the level of work-related stress (p=0.0606). Interestingly, none of the chief medical technologists have a high level of work-related stress. More than half (55.6%) of them were categorized under a low level of work-related stress. Furthermore, most senior medical technologists (66.7%) have a moderate level of work-related stress which was similar to the junior medical technologists (68.9%). Likewise, among junior medical technologists, only 9 (5.5%) have a high level of stress at work. Lastly, more than half of the respondents who have different work positions from the aforementioned categories showed a low level of stress at work and none of them was categorized under a high level of stress at work. Hence, the null hypothesis for the correlation of the level of work-related stress with work position in the clinical laboratory was accepted since the obtained p value was greater than 0.05.

Correlation of the Level of the Level of Work-Related Stress with the Handling of COVID-19 Tests and/or Patients

Table 8. Correlation of the level of work-related stress with the handling of COVID-19 tests and/or patients

	Low		**Moderate**		**High**		**p value*****	**Conclusion**
	n	**%**	**n**	**%**	**n**	**%**		
Handled COVID-19 tests and/or patients*								
Yes	45	25.9	122	70.1	7	4.0	-	-
No	22	41.5	29	54.7	2	3.8		
Handled COVID-19 tests and/or patients**			**Moderate to High , n, %**					
Yes	45	67.2	129			80.6	0.0291	Significant
No	22	32.8	31			19.4		

****. row percentage***
*****. column percentage***
******. p value is significant at <0.05***

Table 8 displays the correlation of the level of work-related stress with the handling of COVID-19 tests and/or patients. This table shows that the handling of COVID-19 tests and/or patients was a significant factor to the level of stress being experienced at their workplace (p=0.0291). Results showed that among the respondents with moderate to high levels of stress at work, the majority (80.6%) have handled COVID-19 tests and/or patients. Likewise, the majority (67.2%) of the respondents with low levels of stress at work have also handled COVID-19 tests and/or patients. Hence, it can be concluded that handling of COVID-19 tests and/or patients was significantly correlated with the level of stress being experienced at their workplace. Specifically, those who handle COVD-19 tests and/or patients were more likely to experience higher levels of work-related

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stress as compared to those who do not. Given this result, the null hypothesis for the correlation of the level of work-related stress with handling of COVID-19 tests and/or patients was rejected.

IV. DISCUSSION

From the 227 surveyed respondents, it was determined that moderate level of work-related stress was the most prevalent (66.52%), particularly among medical technologists with a mean age of 26.7 (±5.5). This was followed by the low level of work-related stress with a prevalence of 29.52%. This finding proved to be consistent with the studies of Sing, et al. [13] and Birhanu, et al. [1]. However, results of the current study were inconsistent with the findings of Gebeyehu & Zeleke [14]. The inconsistency between this study and the current study were mainly due to the number of respondents and the research instrument used.

In the present study, results have indicated that the average age of the respondents was 26.7 (±5.5) and had no significant correlation with the level of work-related stress ($r=0.083$, $p=0.2107$). This result was inconsistent with the research made by Chatzigianni, et al. [15] and Viehmann, et al. [16]. However, regardless of the presence of a statistically insignificant correlation with age, most respondents obtained a moderate level of work-related stress.

In terms of the correlation between the level of work-related stress and gender ($p=0.880$), results showed not significant. This finding was contrary to the findings of Godifay, et al. [17] and Parmar, et al. [18]. Despite its insignificant correlation, the current study observed that many female medical technologists were experiencing moderate to high level of work-related stress. This was an alarming issue that calls for attention, given the fact that females were more prone to experience mental health problems than males [19].

The present study showed that the level of stress being experienced at their workplace was not significantly correlated with marital status ($p=0.2278$). This was consistent with the findings of Yahaya [20] but in contrast with the studies made by Abarghouei, et al. [21], Hasemian et al. [22], and Cheung & Yip [23]. Furthermore, although an insignificant result was obtained, most of the single respondents have moderate level of work-related stress. Likewise, respondents who were noted to have a high level of work-related stress are all single. This result might support the importance of having a partner in a healthy relationship in having a good mental health status.

In terms of the correlation between the level of work-related stress and the type of healthcare facility the respondents are working in ($p=0.093$), findings showed not significant. This was in contrast with the study made by Rajan [24]. Despite its insignificant result, the current study observed that majority of the medical technologists with high level of work-related stress are working in private hospitals. This might be due to the fact that they have to communicate regularly with other people outside the clinical laboratory, such as with in-patients, and other healthcare professionals like nurses and physicians. However, this explanation might not be completely true for the respondents from public hospitals, since they were overpowered from responses by those who work in private hospitals.

In the current study, the level of stress being experienced at work by the respondents was not significantly correlated with the overall years of work experience as a medical technologist

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(r=0.021, p=0.7487) and years of work experience as a medical technologist in the current workplace (r=0.029, p=0.6596). These findings were inconsistent with the results of Koinis, et al. [25], and Singh, et al. [13]. Furthermore, the findings of the current study suggests that the respondents should always be cautious of their stressors at their workplace, regardless of being a veteran or a newly hired worker as these can influence their stress at work.

Moreover, the current study showed that there was no significant correlation between the level of work-related stress and work position in the clinical laboratory (p=0.0606). This finding was inconsistent with studies made by Lai, et al. [26], Godifay, et al. [17], Parmar, et al. [18], and Dang et al. [27]. On the other hand, the findings of the present study were similar to the results of Faremi, et al. [28]. Furthermore, the current study observed that no respondents belonging from the category of chief medical technologists and senior medical technologists have a high level of work-related stress. This was contrary to the description provided by the CHED Memorandum Order No. 14, Series of 2006, where it was implied that work responsibility is proportional to the work position of medical technologists, thereby resulting in a higher level of stress being experienced at work. Therefore, the findings of the current study might imply that there are other factors being experienced by junior medical technologists in clinical laboratories which caused them to have a higher level of work-related stress. This might be because some of them were still on the process of familiarizing the know-hows of their current work or were still struggling to establish a healthy relationship with their colleagues.

In the present study, results showed that the level of work-related stress was not significantly associated with educational attainment (r=-0.036, p=0.5926). This finding was inconsistent with the study of Rajan [24]. However, regardless of a statistically insignificant finding, the correlation coefficient showed a negative relationship between work-related stress and educational attainment. Recent studies found that a lower educational attainment was equated with a higher level of stress at work, which was similar to the finding of the current study [29]. However, this might not entirely true for the current study since 99.6% of the responses came from bachelor's degree holders. Similar to the discussion on the relationship of work-related stress and work position, a different finding might be observed if more respondents with master's degree and doctoral degree were included. This would allow us to better compare the results to the findings of Lunau, et al. [29].

In terms of handling of COVID-19 cases and/or patients, the results of the current study showed that 80.6% of the respondents who have moderate to high levels of work-related stress have handled COVID-19 cases. Likewise, 67.2% of the respondents categorized with low levels of work-related stress have also handled COVID-19 tests and/or patients. Hence, the current study showed that medical technologists in Pampanga, Bulacan, Bataan, and Tarlac who handle COVID-19 tests and/or patients were more expected to experience higher levels of work-related stress than those who do not (p=0.0291). This result was consistent with the article made by Khan, et al. [30] where it was shown that healthcare professionals who were directly involved in such cases experienced work-related stress. Similarly, the result was also consistent with the study made by Jalili, et al. [5] where it was shown that more than half of the surveyed Iranian healthcare professionals handling COVID-19 patients experienced high levels of stress at work. Their study showed that 53.0% of the surveyed medical professionals have high levels of work-related stress, whereas the current study showed that 80.6% of the respondents who have handled COVID-19 tests and/or patients have experienced moderate to high levels stress at work. The differences in

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the results might be because Jalili, et al. [5] exclusively considered healthcare professionals who have handled COVID-19 tests and/or patients as the only respondents. In the current study, only medical technologists were considered, regardless of whether they have handled COVID-19 tests and/or patients or not. In addition, Jalili, et al. [5] also utilized a different research instrument which can also result in different findings. Also, the result of the current study was also consistent with the findings of the studies by Kannampallil, et al. [31] and Schechter, et al. [32] where it was shown that the prevalence of a higher level of work-related stress was significantly higher among respondents that have handled COVID-19 tests and/or patients. The findings of the current study would tell us that majority of the medical technologists who have handled COVID cases in the said locale tend to feel more stressors at work than their counterparts. An example of these additional stressors includes having to worry that they might get infected by SARS-CoV-2 at their workplace. This may contribute to their experiences of having frequent episodes of headaches and body pains due to work-related stress [33]. In addition, this finding calls for an attention, especially for laboratories handling COVID-19 cases, to always be mindful of the mental health status of their medical technology employees. Although protocols against COVID-19 may be implemented in these clinical laboratories, the findings implied that the respondents still feel worried and unsafe in their workplace. On the other hand, it can also be observed from the current study that 19.4% of the respondents who have not handled COVID-19 tests and/or patients have moderate to high level of work-related stress. Specifically, two of the respondents belong to this category have high level of work-related stress. This finding was observed, probably because of the presence of other factors or stressors that might greatly contribute to their stress at their current workplace, such as having a tight schedule or heavy workload.

V. CONCLUSION

With the aforementioned findings of the current study, the researchers conclude that the most prevalent level of work-related stress among medical technologists in Pampanga, Bulacan, Bataan, and Tarlac during the COVID-19 Pandemic is the moderate level of work-related stress. Furthermore, a small percentage of the respondents were seen to have a high level of work-related stress. As frontliners in this pandemic, these healthcare professionals, particularly medical technologists who were included in our study, were at a significant risk of performing poorly in their workplace and can be a reason for them to commit substantial mistakes at work. When left untreated for a long time, the medical technologists, especially those with moderate to high level of work-related stress, are at risk of progressing to burnout. As a result, their condition may pose a threat to their holistic health due to their increased susceptibility of developing physical and mental health problems, such as cardiovascular diseases and depression.

The current study has also found that during the COVID-19 Pandemic, the demographic characteristics of medical technologists in Pampanga, Bulacan, Bataan, and Tarlac does not significantly cause an increased nor decreased number of stressors at work. This result is inconsistent with the findings that were presented in our related literature. However, it only shows that regardless of the demographic characteristics, every medical technologist should still be mindful of one's mental health status, and apply certain interventions, especially when needed. The result highlights the fact that every worker is individualized and are bound to experience lesser or higher number of stressors at work than their colleagues, regardless of their demographic profile. Furthermore, the findings of the study also suggests that other stressors, aside from the

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ones identified by the researchers, might be present and are being experienced by medical technologists at work. This might be one of the reasons why some respondents experienced a higher level of stress at work, contrary to what the literature says, such as in the case of work position in the clinical laboratory.

In terms of handling COVID-19 tests and/or patients, the current study has found that medical technologists who handle COVID-19 cases significantly experienced relatively more stressors at work, as compared to their counterparts, resulting in an increased level of work-related stress. Hence, one of the ways to tackle this problem is to review and improve the existing protocols and guidelines on COVID-19 in clinical laboratories, to reduce the worries of medical technologists from contracting the said disease. Likewise, resolving this issue will also benefit clinical laboratories in preventing the reduction in the quality of healthcare delivery, especially in the conduct and reporting of laboratory tests. Specific interventions that may be applied by clinical laboratories include addressing the concerns of their employees regarding their safety from COVID-19.

Furthermore, since the study has also found that work-related stress is significantly correlated with handling of COVID-19 tests and/or patients, the current study also recommends to future researchers to consider determining the strength in the correlation between the two variables to determine whether the increase in work-related stress due to the handling of COVID-19 tests and/or patients is minimal, moderate or severe. Doing this would require revisions in the survey questionnaire that was used, as well as the utilization of other correlational tests such as Pearson's correlation. The researchers also recommend considering other causes of work-related stress aside from psychological, psychosocial and physical stressors. Future researchers may dwell on measuring the work-related stress of the respondents caused by other types of stressors such as job satisfaction, administrative works or works in specific areas of the clinical laboratory.

Acknowledgements
The research study will not be possible without the aid of the following:

God
For lending us the strength and wisdom for the success and completion of our research study.

Asst. Prof. Gregorio L. Martin, I, PhD, MSMT, MPH, RMT & Assoc. Prof. Florence C. Navidad, EdD, MSMT, RMT, RN
For their untiring advice and guidance in the creation of this research

University of Santo Tomas, Faculty of Pharmacy Review Ethics Committee
For granting us the ethical clearance to conduct data collection for our study.

Mr. Reginald P. Arimado & Ms. Mary Grace S. Razon, MAEd
For sharing their knowledge and validating our obtained data and questionnaire.

The Contact Persons of the Study & The Respondents of the Study
For coordinating and helping us achieve the target sample size needed by the study.

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Department of Science and Technology – Science Education Institute
For providing financial support for the accomplishment of the research paper.

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