COMPARISON OF CORTISOL LEVEL AND WBC COUNT AMONG MALE TRICYCLE DRIVERS IN BATANGAS CITY

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ABSTRACT

An association between cortisol and white blood cell (WBC) and its significant relationship with the subjects' demographic profiles have been previously observed. The researchers came up with this study to determine whether there is a significant difference between the cortisol levels of an individual working in day shift and night shift since there might be an abnormal change in the immune complex of the certain worker and also to determine the relationship of cortisol level and WBC count in terms of the demographic profiles of the subjects. They correlated the levels of cortisol and WBC among male tricycle drivers aged 20-50 working in different shifts and with normal health status in selected tricycle terminals in Batangas City. Covariate includes age, shifts, body mass index (BMI), total serum cortisol and WBC count. Blood was extracted thrice with 10 days interval among the subjects to monitor the levels of their Cortisol and WBC count. Results showed that there is a decreased level of WBC on the 1st collection but then normalizes on the 2nd and 3rd collection while results on Cortisol test showed different levels between two groups proving that there is a significant difference between day shift and night shift. Based on the results, there is only a small percentage that the cortisol level is correlated with WBC Count, affirming that there are lots of other factors that may contribute to the level of cortisol of a specific individual. Also, a insignificant relationship was proven between age and BMI to Cortisol and WBC count. However, it is also demonstrated that shift is significant with Cortisol level but not with WBC count.

Keywords: *Cortisol level and WBC Count, male tricycle drivers, day shift and night shift*

INTRODUCTION

According to Hormone Health Network, cortisol is known to be the "stress hormone" secreted by the adrenal gland. Cortisol or hydrocortisone is a glucocorticoid that is released when stirred by stress, immune regulation or to regulate the sleep-wake cycle, it helps in maintaining blood glucose levels, regulation of metabolism, anti-inflammatory and controlling blood pressure due to its salt and water balance (Mahoney, 2010).

Millard (2016) stated that normally the cortisol level is at its lowest point around 3:00 am and hours before dawn and starts to rise on its peak at around 8 in the morning. It could overachieve and spiking too early in some conditions such as: inadequate sleep, stressed and exhausted.

Normal values for blood cortisol may vary among different laboratories but it has the optimum level of 6–23mcg/dL or 165.53–634.52nmol/L when taken at 8 in the morning. An abnormally high cortisol can be indicated by several diseases like: Cushing's disease and Ectopic Cushing syndrome while in an abnormally low cortisol, diseases like Addison's disease and Hypopituitarism may be indicated (Wisse, 2015).

White Blood Cell (WBC)/leukocyte or white corpuscle is one of the cellular components of blood and an important part of the immune system, which is a network of cells, tissues, and organs that work together to defend the body by attacking foreign cells that invades the body (Higuera, 2016). A healthy adult has a normal reference of 4.5–11x10^9/L, fluctuations in white cell number occur during the day while rest lowers the value of WBC and higher during exercise. Leukocytosis is known when there's an increase in WBC and leukocytopenia when abnormally low.

The purpose of the study is to determine the difference of cortisol level of an individual working in day-time and in night-time and the correlation of cortisol level and WBC count. This study will apprise the respondents of the possible significant effects of having abnormal levels of cortisol and WBC count, thus, making them aware of themselves and its detrimental consequences.

The researchers' hypothesis is to attain significant differences from the outcome of the study to substantiate the weakest and

strongest point of each variable and to provide suitable recommendations to the beneficiaries of the study.

Research Framework

Cortisol is necessary for injury recovery and is capable of inhibiting inflammation in certain clinical conditions like immune response and elevation of WBC count. It can increase the number of leukocytes but can decrease the amount of eosinophils, basophils, lymphocytes, and monocytes specifically. However, too much production of blood cortisol can decrease leukocytes and antibody formation that leads to decreased immunity which leads to individuals to become more vulnerable to colds or flu. This is the most important therapeutic property of cortisol, since it can decrease the inflammatory response of an individual and is capable of suppressing immunity.

Objectives of the Study

The purpose of the study is to determine the demographic profile of the respondents in terms of age, bmi and shift. Also to determine the cortisol and WBC level of the respondents, the significant differences between men working on day shift and night shift and the significant relationship of the cortisol and WBC level when grouped according to profile

METHODOLOGY

The study was conducted among 20 male tricycle drivers with normal health status and aged 20-15 in selected tricycle terminals in Batangas City. The researchers distributed questionnaires among the respondents as a profiling tool together with an informed consent that served as a settlement between the respondents and the researchers.
The 20 respondents gathered were all relevant to be subject of the study, they undergone blood extraction for the testing of Cortisol level and WBC Count for a month with 10 days interval in every blood collection. This was to compare and monitor the level of Cortisol and WBC Count of each respondent. Serum is the specimen of choice

(SOC) for Cortisol Test which measures the amount of cortisol in the blood and whole blood is the SOC for WBC Count. The significance of blood collection was discussed by the researchers.

All blood samples were collected using red-topped tubes and were sent to Intercon Diagnostics Laboratory, Inc. For the viability of samples for WBC, counting was performed by the researchers in the nearest health center which has enough facility to cater the samples for the said test. All smears prepared for WBC counting were checked at LPU-St. Cabrini Instrumentation Room by the researchers and further checking were done at Lipa City District Hospital to ensure the accuracy and reliability of results.

RESULTS AND DISCUSSION

The researchers have used some statistical tools for the utilization of data analysis, which includes ANOVA Table and Pearson product movement. The data were ratio in scale and independent variables were used such as Cortisol (1st collection), Cortisol (2nd collection), Cortisol (3rd collection), WBC (collection #1), WBC (collection #2), WBC (collection #3) and BMI. For further correlation of Cortisol and WBC levels, Pearson product movement was used to see the relevance of the two said variables with one another.

Table 3.1 shows the demographic profile of the respondents in terms of age were 35% of the respondents belong to the group aged 36-40 which has the largest population of the respondents and followed by 41-45 with 25%, 20-25 with 20%, 46-50 with 15% and 26-30 with 5% of the respondents' population. Ranging 20-50.among the respondent's ages.

Table 3.2 shows the demographic profile of the respondents in terms of shift were 50% of the respondents were from day shift and the other 50% were from night shift. Where an equal distribution of respondents were seen, thus making the comparison of two groups significant

Table 3.3 shows the demographic profile of the respondents in terms of BMI that can be classified as severely underweight (below 16.0), underweight (from 16.0 to under 18.5), normal (from 18.5 to below 25), overweight (from 25 to below 30) and obese (greater than 30).

Table 3.4 shows the level of Cortisol among 10 subjects of the

study in Day shift on the first to third blood collection. All results were normal and within the reference range of cortisol which is 3.7-19.4 ug/dL. This result can be correlated to the study of Lindholm et. al, that stated the levels of bedtime Salivary Cortisol (Sa-Cor) did not differ significantly between the Irregular Shift Workers (ISW) and Regular Daytime Workers (RDW) groups. Furthermore, the awakening cortisol levels were significantly higher in the RDW group and the mean Sa-Cor levels were within the reference limits in both groups, and no significant differences were observed later during the day (2012).

Table 3.5 shows the level of Cortisol among 10 subjects of the study in Night shift on the first to third blood collection. It also shows that there is a decreased level of cortisol in every blood collection. 3 subjects on the 1st (N5, N6 and N8) and 3rd (N2, N6 and N8) collection and 4 subjects (N2, N5, N6 and N8) on the 2nd collection. Among the subjects, only N6 and N8 consecutively have a decreased level while others showed normal level and within the reference range of cortisol which is 3.7-19.4 ug/dL Conferring to the study of Shift Work and Endocrine Disorders, cortisol concentrations were low during night shifts and remained unchanged when subject changed over the rotating shifts. However, when the workers of the day time shift switched to the permanent night shift, cortisol levels were initially reduced and tended to normalize after an adaptation period (Kudielka, 2007).

Table 3.6 shows the level of WBC among respondents working in Day shift on the first to third blood collection. All results were decreased during the first collection and normalize on 2nd collection; however there are 3 (D4, D5 and D7) subjects who remained decreased as well as on the 3rd collection (D3, D4 and D10). On the other hand, Table 3.7 shows the level of WBC among respondents working in Night shift on the first to third blood collection. First collection only showed 4 normal results on subjects N1, N2, N3 and N6 and the rest have decreased level. However on the 2nd collection, only 2 subjects (N2, and N10) were decreased and others normalize or remained normal. Lastly, 3 subjects (N4, N5 and N10) have decreased level on the 3rd collection and the rest are normal. Only N10 consecutively has a decreased level of WBC all throughout the blood collection. The reference range of WBC is 4.5-11 $x10^9$/L. This findings can be correlated to Sookoian et al., which stated that leukocyte count was considerably higher in night shift workers than in daytime workers; Puttonen et al. also stated an increase in hs-CRP in 3-shift workers and

an increase in leukocyte count in 2-shift and 3-shift workers. Lu et al. also revealed that increased total and differential leukocyte counts) were related with shift work; in contrast, Nam et al. reported that the total lymphocyte count decreased suggestively in shift workers compared to that in daytime workers (2016).

Table 3.8 shows the statistical results gathered and analyzed using Pearson production movement, the coefficient of determination is ranging from 0.02-0.06 (2%-6%), 0.06 for the correlation of the first collection of Cortisol and WBC indicates moderately high magnitude, 0.02 for the second collection having a low magnitude as well as the 0.04 on the third collection, gathering an average of 0.04 (4%). The researchers proved that Cortisol and WBC levels were clinically related but their correlation is not highly significant because there is only 4% significance proven between the two said variables. The remaining 96% are the other factors that may contribute to the level of Cortisol in an individual. WBC level has a weak significant effect on the cortisol levels, thus their relevance is not really considerable. Perez de Heredia et. al, stated that sleep duration was negatively associated with cortisol levels and WBC counts (2014). Ingram et. al, also cited that disrupted sleep was related to higher concentrations of total lymphocytes and does not affect baseline levels (2015).

Conferring to the articles above, the researchers found out that the relationship between cortisol level and WBC count were not vastly substantial

Table 3.9 shows the significance of Age in Cortisol level and in WBC Count. Significance is equivalent to the P-value or the level of error that the researchers are willing to take to prove that a specific variable is significant to the study. It is common in medical journals to perceive interpretations such as "highly significant" or "very significant" after citing the P value dependent on how close to zero the value is. If P-value is less than or equal to 0.05, then the variable is statistically significant. The values of Cortisol in first, second, and third collection were .438, .513 and .476 respectively which are all greater than 0.05 making Age insignificant with its levels. As for the WBC levels during the collection #1, #2 and #3 with a value of .018, .483 and .154 respectively were all with a larger P-value making age also insignificant with WBC except for collection #1 whose value is less than 0.05.

Halbreich (1984) stated that there is a significant correlation between cortisol levels and age in normal women but not in normal

men. There were also no apparent effects of age or sex on serum cortisol levels according to McKenzie (2003). According to Aminzadeh (2011) there were statistically significant associations between age and history of infection and history of hospitalization. However, WBC count is not always clinically significant to age because of different levels of WBC count. Since total WBC decreases slightly as human ages, the significant result of the study is related to the decreased WBC count of each subject.

Table 3.10 shows the significance of Shift in Cortisol level and in WBC Count. The values of Cortisol in first, second, and third collection were .002, .000 and .001 respectively which are all at a smaller value making Shift significant with its levels. As for the WBC levels during the collection #1, #2 and #3 with a value of .300, .259 and .829 respectively were all with a larger P-value making Shift insignificant with WBC count. In general, individuals who work very early in the mornings have partial sleep deprivation and low morning cortisol concentration compared to those who work the afternoon shift (Diez, 2011) This means that the shift of workers is significant with the level of their cortisol.

CONCLUSION

The demographic profiles of the respondents were big factors that can greatly affect the results of their cortisol level and WBC count. For the age and BMI, both can be correlated with their way of living, thus can be a consideration to distinguish what their cortisol level and WBC count could be. After gathering all the data, the researchers found out that age and BMI have less significance to the results of cortisol level and WBC count of the respondents. In addition, cortisol levels may vary with regards to their shift of work because there is a significant variance between working in day-time and in night-time. The respondents' shift of work was significant as for the results of their cortisol levels, but as for the results of their WBC count, shift is not really substantial.

The results of Cortisol tests of male tricycle drivers working in day-time and night-time show that male tricycle drivers who work in night-time has a higher risk of being immunosuppressed and they were more prone of having any sickness or infection since they might have experienced over fatigue and lack of sleep that may made them

stressed out. On the other hand, no one on the said group of the subjects has obtained an increased level of cortisol.

For the WBC count, estimated results for some of the day-time and night-time male tricycle drivers were all normal while some have decreased levels. With this, the researchers have concluded that cortisol and WBC levels were clinically related but their correlation is not highly significant since there is only 4% significance showed between the two said variables. Therefore, other than cortisol, there may be some other underlying factors that greatly affect the WBC count.

RECOMMENDATIONS

The researchers recommend to those who want to study the same field the researchers have studied is to prepare ahead of time, plan to have more choices of group of respondents and number of respondents as much as they could for them to have a back-up assurance when unexpected matters come and for them to obtain better results.

In searching for the right and desired respondents, the researchers must fully monitor them in order to eliminate any unnecessary outcomes that may give the researchers a hard time obtaining good results. For the profiling, the researchers must set a lower range of age group because way of living is considered as an important factor that can affect one's condition. Moreover, since the correlation of cortisol and WBC is not highly significant, the researchers recommend to look for other factors that have a high relevance and correlation with cortisol in order to make the study more noteworthy and useful.

For the respondents, the researchers encouraged them to be more aware of the health consequences they might have when they lack a lot of sleep and experience over fatigue. Having a complete sleep and good rest are some of the important practices that can be done to maintain good health. It is substantial for them to give importance to their whole well-being to overcome any unnecessary health problems that may occur.

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