

Meta Analysis Study: Relationship Of Work Shift, Nutritional Status With Subjective Fatigue In Hospital Nurses

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Abstract-: Based on data from BPS Indonesia, the number of work accidents in Indonesia in 2016 was 106,644 workers experienced work accidents and in 2017 as many as 102,327 workers had work accidents. Ministry of Health data in 2018, explains that nurses are the highest health personnel in Indonesia, amounting to 345,276 people. Nurse fatigue can affect wherever they work. As a result, fatigue in nurses can have a negative impact on patients, reduce assessment of the health services provided, increase the risk of errors, patient falls, injuries, irregular nursing care, poor communication, and lack of continuity in care.

Destination: This study examines and analyzes the trend of articles explaining the relationship between work shifts, and nutritional status with subjective fatigue in nurses at the hospital.

Method: This study used a retrospective observational study, in the sense that the researcher made a recapitulation of facts without doing experimental manipulation. Effect size. Sources of data using secondary data obtained from previous studies online. Data collection procedures using Google Scholar and Portal Garuda which were involved in the last 5 years. Data were analyzed using Review Manager 5.4 (Revman 5.4).

Result: Of the 565 studies obtained according to the inclusion and exclusion criteria, there were 10 studies that could be continued into the Review Manager 5.4 analysis (Revman 5.4). Where the work shift variable used 7 studies and 7 studies nutritional status. The results of data analysis showed a relationship between work shifts and subjective fatigue in nurses with a p value <0.05, namely p 0.00001 and a pooled odds ratio of 5.46 (95% CI 2.71 - 11.2). The results of data analysis showed a relationship between nutritional status and subjective fatigue in nurses with a p value <0.05, namely p > 0.00001 and a pooled odds ratio value of 6.08 (95% CI 2.90 - 12.75).

Conclusion: There is a relationship between work shift and nutritional status with subjective fatigue in nurses

Index Terms- Shift Work, Nutritional Status, Nurse Subjective Fatigue

I. INTRODUCTION

Fatigue is a condition accompanied by a decrease in efficiency and endurance at work. Fatigue shows different conditions from each individual, but all of them lead to loss of efficiency and decreased work capacity and fatigue is a body protection mechanism so that the body avoids further damage, resulting in recovery (Umyati, 2010). Fatigue from work will reduce performance and increase work errors. A decrease in performance is tantamount to a decrease in work productivity. If the productivity level of a workforce is disrupted due to physical or psychological fatigue, the company will feel the resulting impact in the form of a decrease in company productivity. Basically, productivity is influenced by three factors, namely workload, work capacity, and additional burdens due to the work environment. Workload is usually related to physical, mental and social loads that affect labor. Meanwhile, work capacity relates to the ability to complete work at a certain time. The additional burden due to the work environment includes physical, chemical and labor factors which include biological, physiological and psychological factors (Muizuddin A, 2013).

The existence of nurses as the spearhead of service must be considered and managed professionally so that they can make a positive contribution to society and also to the progress of the hospital itself. The quality of the hospital is very much influenced by several factors. The most dominant factor is human resources. Human resources who are directly involved in providing patient nursing services are doctors, nurses, midwives, and other supporting staff. Among these staff, nurses rank the highest at 40% (Perwitasari and Abdul, 2014). Nurses often experience fatigue in providing nursing services where this condition is a feeling experienced by the nurse herself, but has a difference with feeling weak and occurs continuously.

Based on data from the Indonesian Central Bureau of Statistics, the number of occupational accidents in Indonesia in 2016 was 106,644 workers experienced work accidents and

in 2017 as many as 102,327 workers had work accidents. Based on data from the Ministry of Health in 2018, it was explained that nurses were the highest health personnel in Indonesia, namely 345,276 people. Nurse fatigue can affect wherever they work. Apart from causing work accidents, fatigue can cause nurses to make mistakes in work procedures. As a result, fatigue in nurses can have a negative impact on patients, reduce assessment of the health services provided, increase the risk of errors, patient falls, injuries, irregular nursing care, poor communication,

The factors that cause fatigue, namely work factors such as work time, work shifts, rest time, incentives, physical environmental conditions, workload, job demands, psychosocial, organizational culture, individual roles, and lifestyle factors such as sleep disorders, life. social responsibility, family responsibilities, other work, health conditions, nutrition, and sports. Physical workload requires muscle, heart and lung work, so that if the physical workload is high, the work of the muscles, heart and lungs will also be higher, and vice versa (Sabaruddin and Zahroh, 2019).

Nutritional status has an important relationship with the performance of workers. A person's work capacity can be disrupted when energy needs both qualitatively and quantitatively are not fulfilled (Mustofani, 2020). Heavy workload and sleep disruption (sleep disruption) are also associated with lack of sleep and disruption to circadian rhythms due to work shifts which are the most frequent causes of work fatigue in nurses (Lutfbis and Anih, 2018).

Problems related to work fatigue must be resolved. Apart from being able to relate to safety in the workplace and reducing work productivity rates, long-term work fatigue can also have an impact on the health of workers. Several health risks that can occur as a result of prolonged work fatigue, including heart disease, diabetes, high blood pressure (hypertension), digestive system disorders, decreased fertility, anxiety, and depression (Mustofani, 2020).

Based on the description above, the researcher is interested in mapping the results of research related to the relationship between work shifts, nutritional status and subjective fatigue in nurses through meta-analysis. Because many factors are related to subjective fatigue in nurses, namely rest time, incentives, physical environmental conditions, job demands, psychosocial, organizational culture, individual roles, and lifestyle factors such as sleep disorders, social life, family responsibilities, other jobs, conditions. health, and sports including work shifts, workload and nutritional status that need further analysis.

II. RESEARCH METHOD

Research on systematic literature review or synthesis that is quantitative in nature uses a meta-analysis research design with a correlation meta-analysis research design. Meta analysis is used to analyze empirical studies that have been conducted by previous researchers, quantitative research results, research results in comparable forms such as means,

correlation coefficients, and odds-ratios. In the correlation meta-analysis, the research design carried out was the same as other types of meta-analysis studies, which focused on statistical analysis (Retnawati et al, 2018).

Secondary data used were obtained from previous studies online. The data is in the form of books and primary reports or the results contained in scientific publication articles or national journals or international journals.

In this Meta Analysis research design, using the literature published in 2016-2020 which can be accessed in full text in pdf format. By searching for data through journal portal websites that can be accessed such as Research Gate, Science Direct, PubMed, Garuda Portal, and Google Scholar Literature that has been used for at least the last 5 years. Researchers conducted article searches using search engines, including Google Scholar, Garuda Portal, DOAJ. Keywords used in the collection of articles are "fatigue, fatigue, work, work, nurses, nurses, in hospital, in hospital". After searching, more than 565 articles were found about the relationship between shifts, and nutritional status with subjective fatigue in nurses, then screened according to shift variables, and nutritional status with subjective fatigue on nurses and adjusted for inclusion criteria, found 16 articles. After being reviewed and fulfilling the requirements for statistical tests, finally 10 articles were obtained to be analyzed.

Data were analyzed using Review Manager 5.4 software. Data analysis was performed to obtain the value of the pooled odds ratio (pOR), which is the combined odds ratio value from research journals using a fixed effect model and a random effect model. The heterogeneity test was carried out in order to determine the incorporation model in the meta-analysis. The I² statistical test was conducted to assess the heterogeneity among a number of study effect sizes expressed in percentage terms. The final result of the meta-analysis is a forest plot with a pooled odds ratio and an effect size in each study. The funnel plot results were also analyzed for publication bias assessment of the final meta-analysis. The final value used as an answer to the research objectives is the value of the pooled odds ratio which shows the combined OR value of several studies. This shows how much the likelihood of the relationship between each of the variables studied.

III. FINDINGS

The number of studies that were combined to analyze the relationship between work shifts and subjective fatigue in nurses in the hospital were 7 studies, all of which were cross-sectional with a total sample of 667. The following are the results of a meta-analysis of the relationship between work shifts and subjective fatigue in nurses. in the Hospital (Table 1). The number of studies that were combined to analyze the relationship between nutritional status and subjective fatigue in nurses at the hospital were 7 studies, all of which were cross-sectional with a total sample of 689. The following is a meta-analysis of the relationship between nutritional status and subjective fatigue in nurses in the Hospital (Table 2).

Table 1. Research Characteristics Relationship between Work Shift with subjective fatigue in hospital nurses

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No.			Number of samples	P Value	P-OR	95% CI
1	Yunita Suwarni, Izaak Zoelkarnain Akbar, Eko Suhartono, Husaini, Fauzie Rahman	2020	132	0.741	1.29	0.54-3.08
2.	F Saftarina, D Vilia	2020	153	0.001	3,479	1,398-8,659
3	Devi Purnamasari et al	2020	54	0.0072	12.43	1.98-78.15
4	Nur Aini	2019	130	0.016	8.61	2.09-35.56
5	Rayi Trinofiandy	2018	45	0.393	2,071	0.4-69.10,4
6	Toar A. Angouw, Johan Josephus, Sulaemana E	2016	123	0.06	0.42	0.16-1.04
7	Fatmawaty Mallapiang, Syamsul A, Andi AS	2016	30	0.875	0.82	0.18-3.74
Total Sample: 667						

Table 2. Research Characteristics Relationship Between Nutritional Status with Subjective Fatigue in Hospital Nurses

No.	Researcher	Publication Year	Number of samples	P Value	OR	95% CI
1	Asna Ampang Allo, Masyitha Muis Ansariadi, Atjo Wahyu, Syamsiar S. Russeng, Stang	2020	56	0.001	7.39	2.26-24.23
2	Devi Purnamasari et al	2020	54	0.866	1,062	0.53-2.14
3	F Saftarina, D Vilia	2020	153	0.944	1.13	0.47-2.42
4	Yunita Suwarni, Izaak Zoelkarnain Akbar, Eko Suhartono, Husaini, Fauzie Rahman	2020	132	0.484	1.12	0.46-2.73
5	Erny Elvianny Sabaruddin, Zahroh Abdillah	2019	154	0.126	3,938	0.911-17,014
6	Rayi trinofiandy	2018	45	0.034	8,500	0.9-206
7	Rizki Rahmawati	2019	95	0.001	5.37	2.08-13.83
Total Sample: 689						

Meta Analysis The Relationship Between Work Shift with Work Fatigue in Hospital Nurses

Based on table 3, it shows the results of data analysis from 3 studies on the relationship between work shifts and subjective fatigue in nurses at the hospital and analyzed using the fixed effect model analysis model. The results of the heterogeneity

test showed that the variation of the study was very high heterogeneous, with a p value = 0.40 and the variation value between studies (I²) of 0%.

The results of data analysis displayed on the forest plot indicate that there is a relationship between work shifts and subjective fatigue in nurses in the hospital with a p value

<0.05, namely p 0.00001 and a pooled odds ratio value of 5.46 (95% CI 2.71 - 11.2), so it can be concluded that nurses who have high work shifts have a risk or tend to be 5.46 times more likely to increase subjective fatigue in nurses in the hospital compared to nurses who have low work shifts. Based on Figure 1, the funnel plot of the relationship between work shift and subjective work fatigue on nurses shows that there is a publication bias which is marked by asymmetry in

the right plot there are 2 and the left plot is 1. The left plot has a standard error of 0.45 while the right plot has a standard error of 0.72. In addition there is 1 plot on the right side away from the vertical center line. This indicates that there is a publication bias in the study. Publication bias can be seen from the imbalance of the distance between the studies from both the right and left side of the funnel plot.

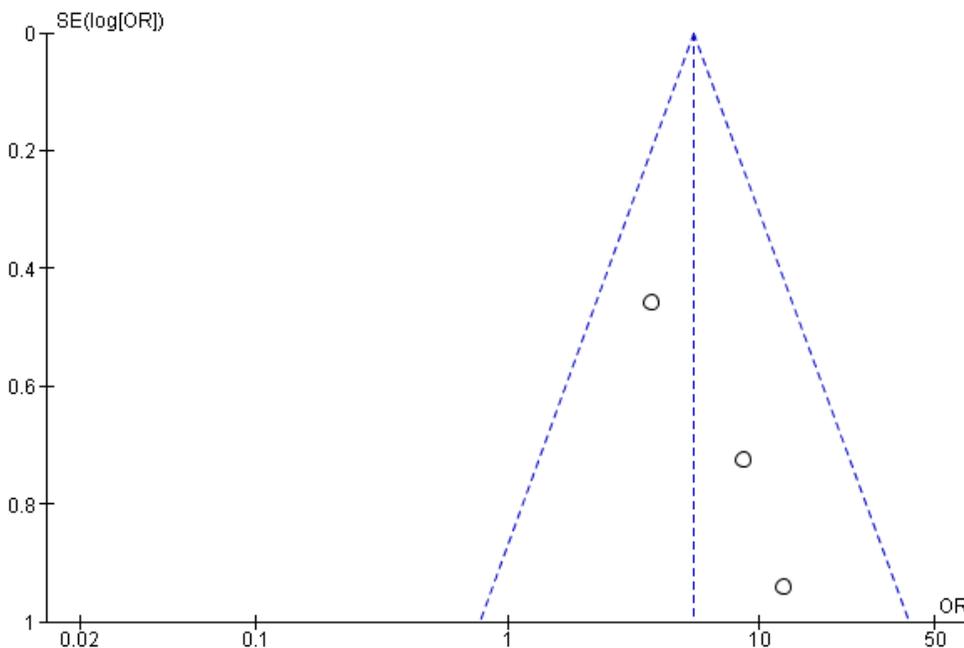
Table 3 Forest Plot Analysis There is a relationship between work shifts with subjective fatigue in hospital nurses

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Fixed, 95% CI	Odds Ratio IV, Fixed, 95% CI
Devi 2020	2.5204	0.9379	14.6%	12.43 [1.98, 78.15]	
Nur 2018	2.1535	0.7234	24.5%	8.61 [2.09, 35.56]	
Saftarina 2020	1.318	0.4586	60.9%	3.74 [1.52, 9.18]	
Total (95% CI)			100.0%	5.46 [2.71, 11.02]	

Heterogeneity: Chi² = 1.85, df = 2 (P = 0.40); I² = 0%
Test for overall effect: Z = 4.74 (P < 0.00001)

Information :

-  : Odds Ratio for each study
-  : Combined odds ratio
- | : Odds ratio - 1



Picture 1 Funnel Plot of the Relationship Between Work Shift with Work Fatigue in Hospital Nurses

Information:

-  : White diamond illustrates pooled OR

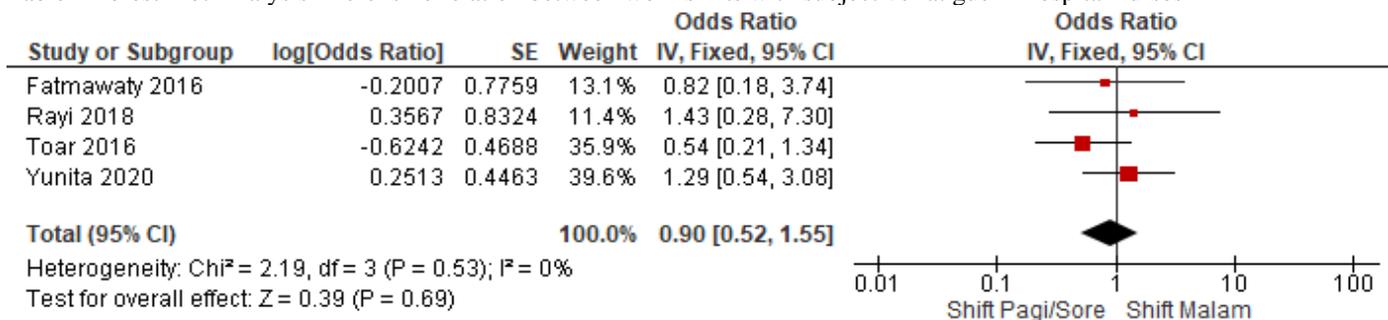
Based on table 4, it shows the results of data analysis from 4 research studies, the results of which state that there is no relationship between work shifts and subjective fatigue in nurses at the hospital and were analyzed using the Fixed Effect Model analysis model. H, with a p value greater than 0.05 in the heterogeneity test, namely p = 0.53 and the variation value between studies (I²) of 0%. The results of the data analysis displayed on the forest plot show that the results of the two studies indicate that there is no

relationship between work shift and subjective fatigue in nurses in the hospital, after a combined analysis, it shows that the results still have no relationship with p value > 0.05, namely p = 0.69 and the pooled odds ratio value of 0.90 (95% CI 0.52 - 1.55), so it can be concluded that nurses who have high work shifts have or tend to be 0.90 times at risk of increasing subjective fatigue in nurses compared to with nurses who have low shifts.

Based on Figure 2, the funnel plot of the relationship between work shifts and subjective work fatigue shows that there is no publication bias which is indicated by the symmetrical plot of the right 2 plots and 2 plots left. The left plot has a standard error of 0.46, while the right plot has a standard error of 0.44.

Plots that are above the curve indicate that the study has high ES while studies with plots that are below the curve show that the study has low ES and plots that touch the vertical line indicate that the study biases the meta-analysis.

Table 4 Forest Plot Analysis There is no relation between work shifts with subjective fatigue in hospital nurses



Information :

- : Odds Ratio for each study
- : Combined odds ratio
- : Odds ratio - 1

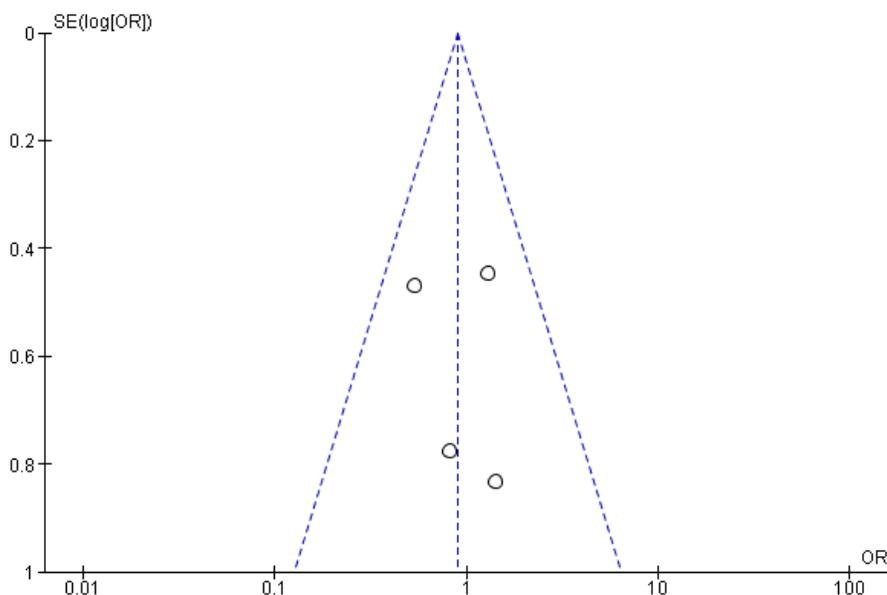


Figure 2. Funnel plot There is no relationship between shift work with fatigue in the hospital nurses

Information:

- : White diamond illustrates pooled OR

Based on table 5, it shows the results of data analysis from 7 research studies, the results of which state the relationship between work shift and subjective fatigue in hospital nurses and analyzed using the Random Effect Model analysis model. The results of the heterogeneity test showed that the variation of the study was very high heterogeneous, with a p value greater than 0.05 in the heterogeneity test, namely p = 0.003 and the variation value between studies (I²) of 70%.

The results of data analysis displayed on the combined forest plot show that the results of the two studies show a relationship between Work Shift and Nurse Fatigue in the Hospital, after a combined analysis, the results show no

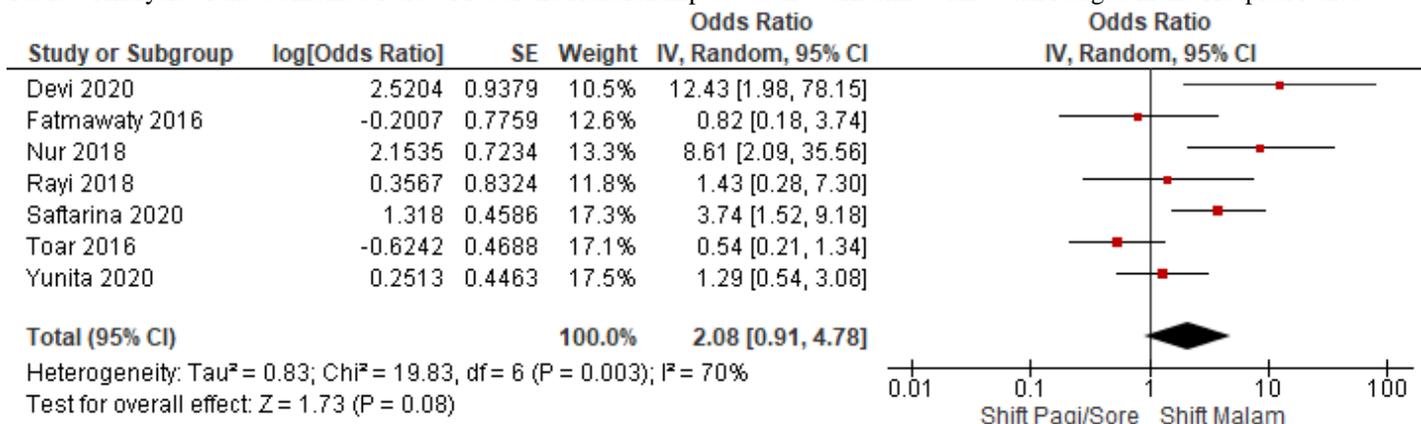
relationship with p value > 0.05, namely p = 0.08. and the value of the pooled odds ratio is 2.08 (95% CI 0.91 - 4.78), so it can be concluded that nurses who have high work shifts have or tend to be 2.08 times at risk of increasing subjective fatigue in nurses compared to nurses who have high shift work low.

Based on Figure 3, the combined funnel plot of the relationship between work shift and subjective work fatigue shows that there is no publication bias which is marked by asymmetry of 3 and 4 left plots and the left plot has a standard error of 0.440 and the right plot has a standard error of 0.445. Plots that are above the curve indicate that the study has high

ES while studies with plots that are below the curve show that the study has low ES and plots that touch the vertical line

indicate that the study biases the meta-analysis.

Table 5 Analysis of the Combined Forest Plot of the Relationship between Work Shift with Work Fatigue in the Hospital Nurses



Information :

- : Odds Ratio for each study
- : Combined odds ratio
- : Odds ratio - 1

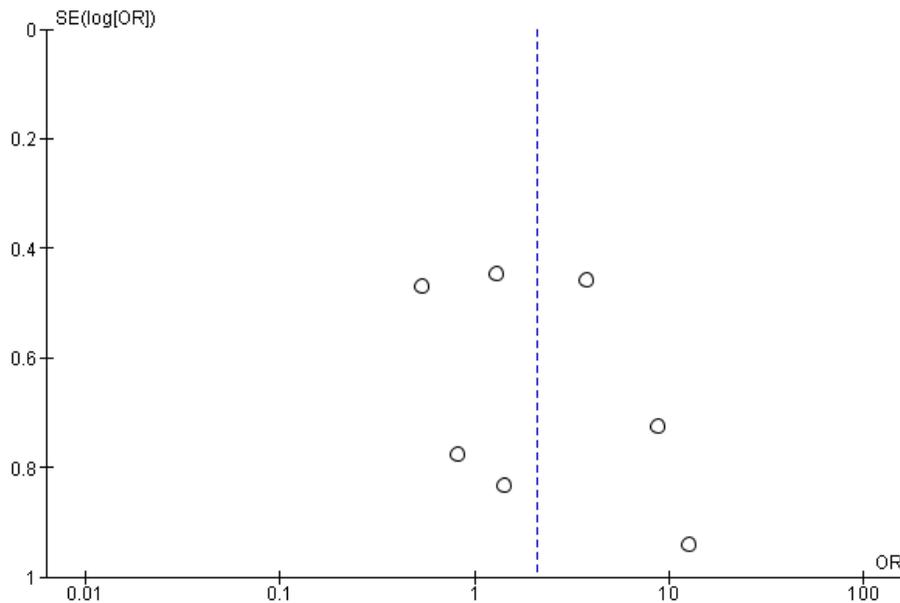


Figure 3. Funnel Plot Combined The Relationship Between Work Shift with Work Fatigue in the Hospital Nurses

Information :

- : White diamond illustrates pooled OR

Relationship Between Nutritional Status and Nurse Fatigue

Based on table 6, it shows the results of data analysis from 2 research studies where the results state there is a relationship and are analyzed using the fix Effect Model analysis model. The results of the heterogeneity test showed that the variation in the study was low heterogeneous, with a p value = 0.68 and a variation value between studies (I2) of 0%.

The results of data analysis displayed on the forest plot indicate that there is a relationship between nutritional status and subjective fatigue in nurses at the hospital with a p value

<0.05, namely p> 0.00001 and a pooled odds ratio of 6.08 (95% CI 2. , 90 - 12.75), so it can be concluded that nurses with low nutritional status increase the risk or tend to experience work fatigue 6.08 times compared to nurses with good nutritional status.

Based on Figure 4, the funnel plot of the relationship between work nutritional status and subjective work fatigue on nurses shows that the number of left and right plots is the same as 1 plot. The left plot has a standard error of 0.48 and the right plot has a standard error of 0.605. Publication bias is not visible based on this funnel plot because both plots are close to the vertical center line. Plots that are above the curve indicate

that the study has high ES while studies with plots that are below the curve show that the study has low ES and plots that

touch the vertical line indicate that the study biases the meta-analysis.

Table 6 Forest Plot Analysis There is a Relationship between Nutritional Status with Work Fatigue in Hospital Nurses

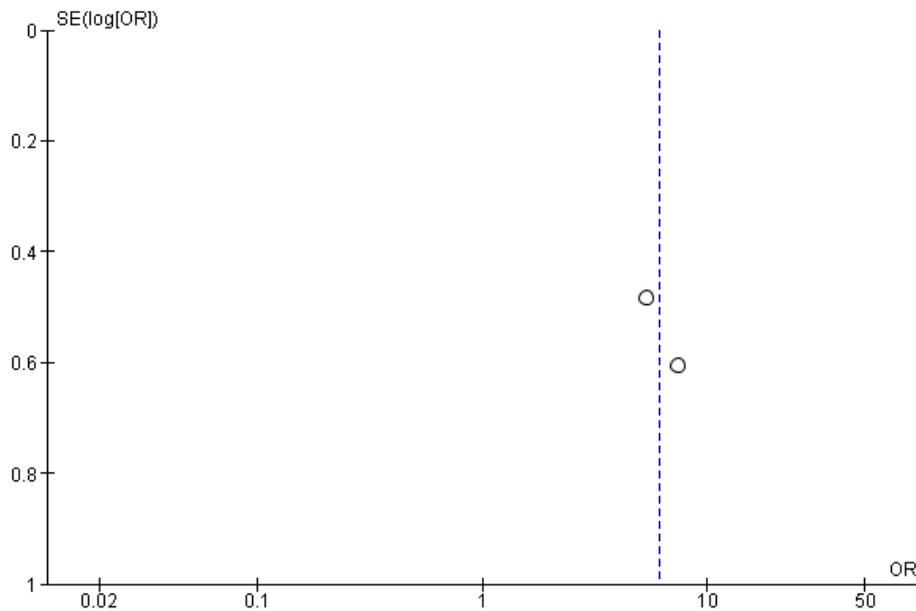
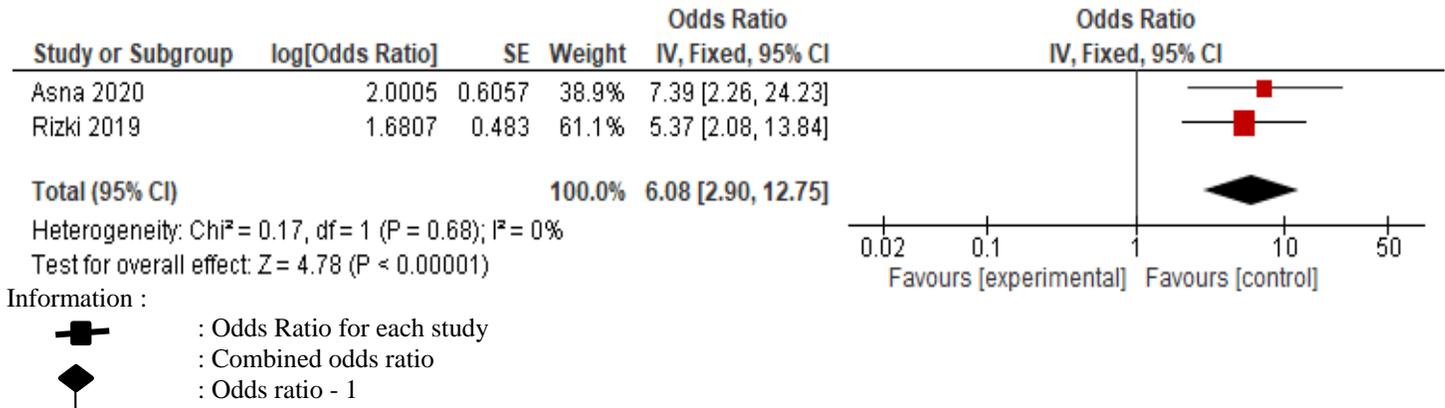


Figure 4. Funnel plot There is a relationship between nutritional status with fatigue in the hospital nurses

Information:

: White diamond illustrates *pooled OR*

Based on table 7, it shows the results of data analysis from 5 research studies, the results of which state there is no relationship between nutritional status and subjective fatigue in nurses at the hospital and analyzed using the Fixed Effect Model analysis model. The results of the heterogeneity test showed that the variation in the study was low heterogeneous, with a p value greater than 0.05 in the heterogeneity test, namely p = 0.11 and the variation value between studies (I²) of 47%.

The results of the data analysis displayed on the forest plot show that the results of the two studies show no relationship

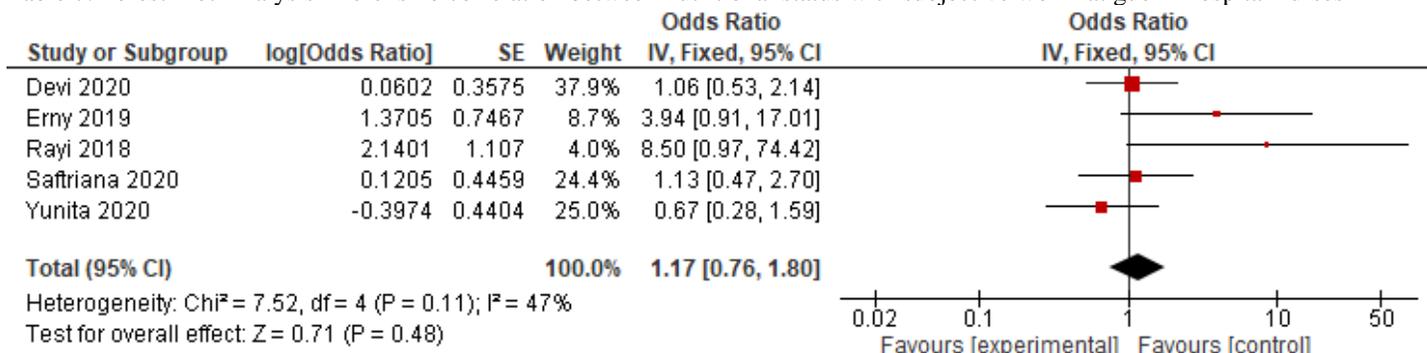
between nutritional status and work fatigue of nurses in the hospital, after a combined analysis, it shows that the results still have no relationship with p value > 0.05, namely p = 0.48 and the value of the pooled odds ratio is 1.17 (95% CI 0.76 - 1.80;), so it can be concluded that it can be concluded that nurses with poor nutritional status increase the risk or tend to 1.17 times experience subjective fatigue compared to nurses. good nutritional status

Based on the 5 funnel plot of the relationship between work nutritional status and subjective fatigue at work fatigue in nurses at the hospital, it shows that there is a publication bias

which is characterized by asymmetry of right and left plots where there is 1 plot on the left and 2 plots on the right and 2 plots on the vertical center line. . The left plot has a standard error of 0.44 and the left plot has a standard error of 0.74. Publication bias can be seen from the imbalance of the

distance between the studies both from the right and left sides. Plots that are above the curve indicate that the study has high ES while studies with plots that are below the curve show that the study has low ES and plots that touch the vertical line indicate that the study biases the meta-analysis.

Table 7. Forest Plot Analysis There is no correlation between nutritional status with subjective work fatigue in hospital nurses



Information:

- : Odds Ratio for each study
- : Combined odds ratio
- : Odds ratio - 1

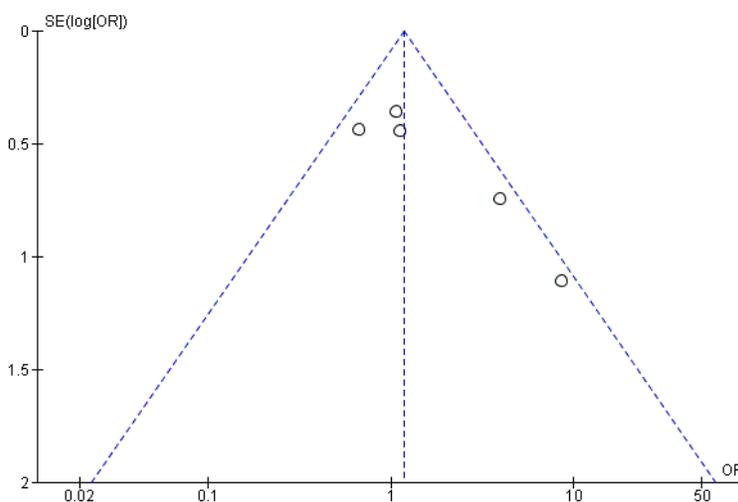


Figure 5. Funnel plot There is no relationship between nutritional status and fatigue

Information :

- : White diamond illustrates pooled OR

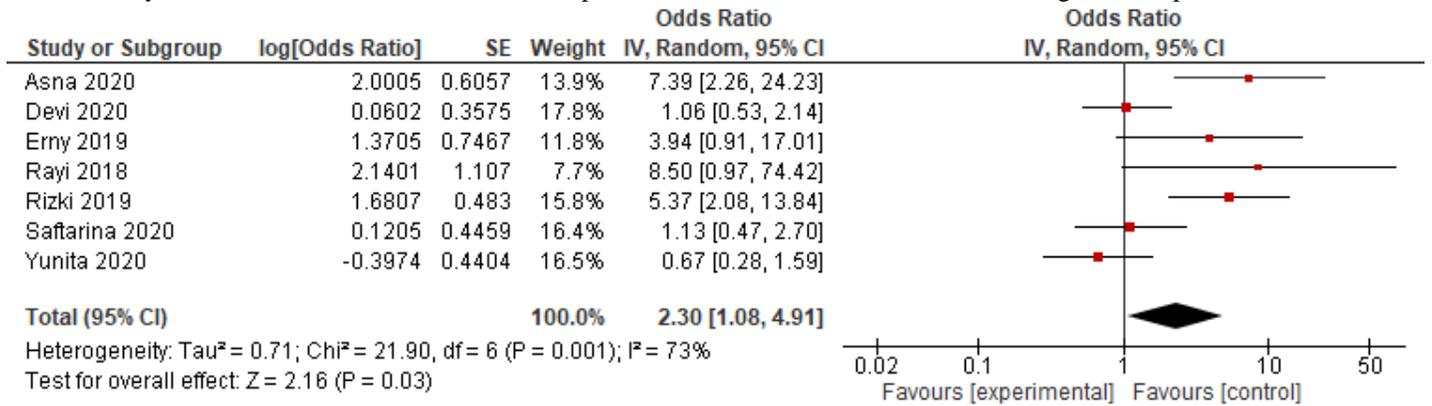
Based on table 8, it shows the results of data analysis from 5 research studies where the results state there is a relationship and are analyzed using the Random Effect Model analysis model. The results of the heterogeneity test showed that the variation in the study was quite high heterogeneous, with a value of p = 0.03 and a value of variation between studies (I²) of 73%.

The results of data analysis displayed on the forest plot indicate that there is a relationship between nutritional status and work fatigue of nurses in the hospital with a p value <0.05, namely p > 0.03 and a pooled odds ratio value of 2.30 (95% CI 1, 08- 4.91), so it can be concluded that nurses with low nutritional status increase the risk or tend to experience

work fatigue 2.30 times compared to nurses with good nutritional status.

Based on the 6 funnel plot the relationship between work nutritional status and subjective work fatigue in nurses at the hospital shows that there is a publication bias which is characterized by asymmetry of right and left plots where there are 3 plots on the left and 4 plots on the right and do not form an inverted funnel. The left plot has a standard error of 0.357 while the right plot has a standard error of 0.48. Publication bias can be seen from the imbalance of the distance between the studies both from the right and left sides and does not form an inverted funnel in the funnel plot.

Table 8 Analysis of Combined Forest Plot Relationship Between Nutritional Status with Work Fatigue in Hospitals Nurses



Information :

-  : Odds Ratio for each study
-  : Combined odds ratio
-  : Odds ratio - 1

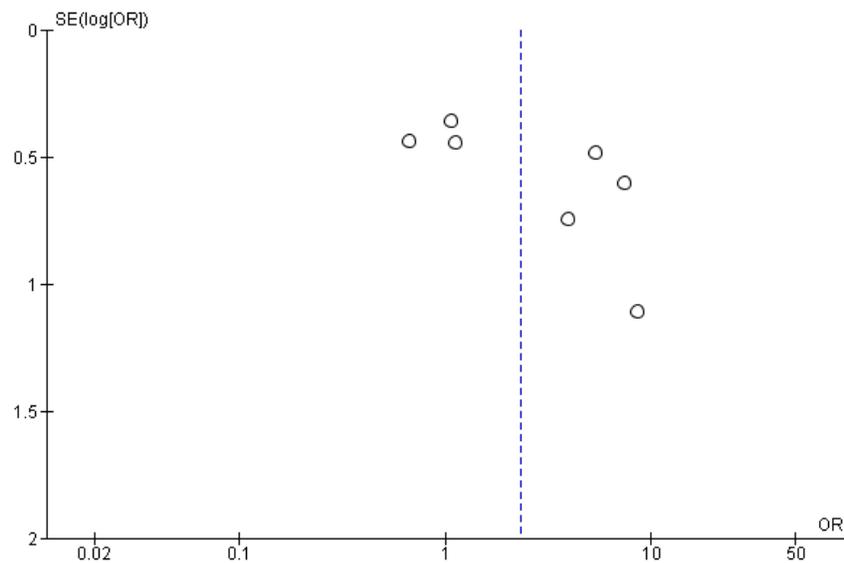


Figure 6. Funnel Plot Combined The Relationship Between Nutritional Status with Work Fatigue in Hospitals Nurses

Information:

-  : White diamond illustrates pooled OR

Meta analysis of the Factors Most Associated with Work Fatigue

Table 9 explains that the relationship between work shifts and subjective fatigue of nurses in hospitals, there are 3 studies that analyzed the relationship between work shifts and subjective fatigue of nurses in hospitals which has low heterogeneity, namely 0% with a pooled odds ratio of 5.46 (95% CI 2.71-11.02), so it can be concluded that nurses who have high work shifts have a risk or tend to be 5.46 times at risk of experiencing subjective fatigue compared to nurses who have low work shifts. While the 4 studies that analyzed there was no relationship between work shifts and subjective fatigue in nurses in the hospital had low heterogeneity, namely 0% with a pooled odds ratio value of 0.90 (95% CI 0.52-1.55),

The table below explains that the relationship between nutritional status and subjective fatigue in nurses at the hospital, there are 2 studies that analyzed the relationship between nutritional status and subjective fatigue in nurses at the hospital which has low heterogeneity, namely 0% with a pooled odds ratio value of 6.08. 95% CI 2.90-12.75), so it can be concluded that nurses with low nutritional status increase the risk or tend to experience subjective fatigue 6.08 times compared to nurses with good nutritional status. nutrition with subjective fatigue in nurses at the hospital has moderate heterogeneity, namely 47% with a pooled odds ratio value of 1.17 (95% CI 0.76-1.80),So it can be concluded that it can be concluded that nurses with poor nutritional status increase the risk or tend to be 1.36 times less likely to experience

subjective fatigue compared to nurses with good nutritional status.

Table 4.10 Comparison of Research Results whether or not there is a relationship between research variables and Work Fatigue.

Research variable	There is a relationship		No relationship	
	Heterogeneity Test	Result	Heterogeneity Test	Result
Shift Work	P = 0.40 I2 = 0% (low heterogeneity)	5.46 (2.71-11.02)	P = 0.53 I2 = 0% (low heterogeneity)	0.90 (0.52-1.55)
Nutritional status	P = 0.68 I2 = 0% (low heterogeneity)	6,08 (2.90-12.75)	P = 0.11 I2 = 47% (low heterogeneity)	1.17 (0.76-1.180)

IV. DISCUSSION

Work Shift Relationship with Work Fatigue

a. Research Heterogeneity and Variation

The results of the analysis show different variance values and weights. The theory expressed by Dahlan (2012) states that the weight in a study is directly proportional to the number of research subjects (research sample). Research with 100 subjects will have a greater weight than research with 50 subjects. In addition to the number of subjects, the weight is also influenced by variations in data. Weight is inversely proportional to data variation. Research with more varied data will have less weight than studies with smaller variations.

Objectively, the determination of the role of variation between studies was tested by heterogeneity test. If the results show $p > 0.05$, it means that the variation between studies does not contribute to the total variation, on the contrary, if the heterogeneity test results show $p < 0.05$, it is stated as heterogeneous, which means that the variation between studies has a role in the total variation. In addition to the p value, data variation also looks at the value of variation between studies (I2). If there is a result of 50% and below it can be categorized as homogeneous variation and if it is above 50% it is considered heterogeneous. The null hypothesis is rejected if the p value in the heterogeneity test is greater than 0.05 (Dahlan, 2012). The results of the heterogeneity test on 3 research studies which stated the relationship between work shifts and subjective fatigue in nurses in the hospital was I2 = 0% and the value of $p = 0,40$ expressed heterogeneity at a low level. The variation of the 3 research studies had no effect on the total variation after the combined effect.

Three studies which stated that there is a relationship between work shifts and subjective fatigue in nurses at the hospital have different characteristics with variations in the number of samples whose size does not match the population, so in the end they have an effect after the merger is carried out. The test results show low heterogeneity so that it uses fixed effect models in measuring the combined effect of the data in the data input model in the Revman 5.4 computer application. The results obtained were $p\text{-OR} = 5.46$ with a 95% confidence interval: 2.71 to 11.2. The combined effect also produces a Z value of 1.73 and a p value of <0.08 . Statistically, the combined effect is not significant if the value of $p > 0.05$ and this means that the null hypothesis is accepted, in other words there is no relationship between work shifts and subjective fatigue in nurses at the hospital.>

In the three studies analyzed using Revman 5.4 it can be seen that based on the funnel plot there is a bias value for a low level of heterogeneity. This explains that the studies analyzed have a data variation that is not too wide where in the study it can be seen that the highest effect size is 12.43 (95% CI 1.98 - 78.15) and the lowest is 8.61 (95% CI 2.09-35.56), this explains that the variation of the data in the analyzed studies shows no significant difference. The higher the heterogeneity, the wider the confidence interval value and conversely the lower the heterogeneity value, the narrower the confidence interval value.

Meanwhile, the heterogeneity test of 4 research studies which stated that there was no relationship between work shifts and work fatigue showed a value of $p = 0.53$ and a value of I2 (variation between studies) of 0% was declared homogeneous. Variation in 4 research studies had no effect on total variation after the combined effect. These two studies have almost the same characteristics with variations in the number of samples, the size of which does not match the population but does not have a significant effect after the combination.

The results of the heterogeneity test show a homogeneous value so that the analysis uses fixed effect models in measuring the combined effect of the data in the data input model in the Revman 5.4 computer application. The results obtained are $p\text{-OR} = 0.90$ with a 95% confidence interval: 0.52 to 1, 55. The combined effect also produces a Z value of 1.73 and a p value of <0.08 . Statistically, the combined effect is not significant if the p value is <0.05 and this means that the null hypothesis is accepted, in other words there is no relationship between work shifts and subjective fatigue in nurses at the hospital.

The results of 4 studies analyzed using Revman 5.4 can be seen that based on the funnel plot there is a bias value of low heterogeneity. This explains that the studies analyzed have a data variation that is not too wide where in the study it can be seen that the highest effect size is 2.071 (95% CI 0.4-69.10.4) and the lowest is 0.42 (95% CI 0.16-1.04), this explains that the variation of the data in the analyzed studies shows no significant difference. The higher the heterogeneity, the wider the confidence interval value and conversely the lower the heterogeneity value, the narrower the confidence interval value.

b. Analysis of Research Results

This study is the first meta-analysis study that analyzes the relationship between work shifts and subjective fatigue in

nurses at the hospital. Many studies have analyzed the work shifts associated with subjective fatigue in nurses at the hospital. For this reason, statistical analysis is carried out using meta-analysis to prove the quality of each study so that new quantitative data can be obtained and more accurate conclusions can be drawn.

The search results of journals from various sources in the end resulted in 39 studies relevant to the title and only 16 studies that matched the inclusion criteria and could be analyzed into meta-analysis using the Revman 5.4 application software. Even though in the end only 10 studies were obtained, the research could be continued using meta-analysis because according to Sastroasmoro (2011) in his book it states that meta-analysis is a combination of two or more studies. So it can be concluded that with a minimum of two studies, a quantitative analysis can be carried out using meta-analysis.

These three studies were analyzed by involving research samples from the total number of samples in each research study. For the 3 research studies that stated there was a relationship between work shifts and subjective fatigue in nurses in the hospital, the total sample was 337 samples. The results of the combined effect concluded that work shift was associated with subjective fatigue in nurses in the hospital with a p value <0.00001 and pOR = 5.46 and a 95% confidence interval (2.71 to 11.02 on the funnel plot. Work has a relationship with subjective fatigue in nurses in the hospital = with a moderate level of relationship, where high shift nurses have a tendency to increase the risk of experiencing subjective fatigue 5.45 times compared to low shift nurses.

The results of 4 research studies which stated that there was no relationship between work shifts and subjective fatigue in nurses in the hospital with a total sample of 330 samples. The results of the combined effect concluded that work shift was not associated with subjective fatigue in nurses in the hospital with a value of p = 0.39 and pOR = 0.69 and a 95% confidence interval (0.52 to 1.55) on the funnel plot. The results of these research studies each state that the results have no relationship, and after conducting the combined analysis, the results still show no relationship with a p value > 0.05, namely p = 0.69. It can be concluded that shift work is not associated with subjective fatigue in nurses at the hospital.

The results of the analysis for 3 research studies which stated that there was a relationship between work shift and subjective fatigue in nurses in the hospital after a combined analysis showed that there was a relationship with low heterogeneity data variations as well as 4 studies which stated there was no relationship after a combined analysis still showed no relationship. there is a relationship with low heterogeneity.

c. Comparison of Meta-analysis Results

Table 10. Comparison of Research Stating There is or Not a Relationship between Work Shift and Work Fatigue

Research variable	There is a relationship		No relationship	
	Heterogeneity Test	Result	Heterogeneity Test	Result
Shift	P = 0.40	5.46	P = 0.53	0.90
Work	I2 = 0%	(2.71-	I2 = 0%	(0.52-

	(low heterogeneity)	11.02)	(low heterogeneity)	1.55)
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The results of three studies which stated that there was a relationship between work shifts and subjective fatigue in nurses at the hospital.

Aini (2019) in her research explains that based on the results of the chi-square statistical test using the SPSS program, it shows that there is a very significant relationship between work shifts and subjective fatigue in nurses in hospitals. This is indicated by a significant value of p = 0.016 or p <0.05. From this analysis, it can be seen that among the morning, evening and night shifts that have the highest level of fatigue is found on night shifts because the long working hours reach 9 hours in one shift and the lack of sleep time causes the nurses to often feel sleepy and want to lie down. It is known that sleeping during the day is not as effective as at night. The number of activities carried out by nurses is also required to provide good nursing care actions for patients and to always be alert and not to be careless in watching the patient. Nurses who work at night are very easily tired because the time that should be used for sleeping and resting is actually used for work.

Saftrina's research (2020) proves that work shifts are related to work fatigue in nurses with a p-value = 0.001 because most of them are nurses with work shift patterns (98 respondents, 85 of whom experienced moderate fatigue and 13 people experienced severe fatigue). The research of Lufbis (2018) also states that there is a relationship between work shifts and work fatigue with a p-value = 0,000 which means there is a relationship. This is because as many as 26 people (83.9%) nurses who have heavy work shifts with good performance, while nurses who have heavy work shifts with poor performance are 5 people or about 16.1% of the 70 nurses. who are the respondents. With a minimum value of 5,872 and a maximum of 69,141 it has an OR value of 20,150.

Devi (2020) research proves that work shift is associated with fatigue in nurses at the hospital p value = 0.0072 and has an OR value of 12.43 and CI 1.98-78.15. In other words, high shift work has a tendency to experience fatigue by 20,150 times compared to nurses who have low shifts.

The researcher assesses that the inconsistent research results from the relationship between work shifts and work fatigue apart from the weight and power of the research that are not yet ideal, are also related to differences in place and socio-culture, where work shifts are different, namely there are work shifts that pose a risk. work fatigue and there are also work shifts that do not pose a risk of work fatigue. According to the researcher's assessment, work shifts that are not in accordance with the schedule can be a risk of work fatigue in nurses where nurses work improperly which time can be used for resting but used for work and cause work fatigue so that nurses work not optimally. .

The Relationship between Nutritional Status and Work Fatigue

a. Research Heterogeneity and Variation

The analysis of five studies that analyzed the relationship between nutritional status and subjective fatigue in nurses at the hospital showed the results of different variance values and weights. The determination of the role of variation between studies was tested by heterogeneity test. The results of the heterogeneity test on 2 research studies which stated that the results of the relationship between nutritional status and subjective fatigue in nurses in the hospital were $I^2 = 0\%$ and p value = 0.68. The variation of the 2 research studies has no effect on the total variation after the combined effect. The null hypothesis is accepted if the p value in the heterogeneity test is more than 0.05 (Dahlan, 2012).

Two studies which stated that there was a relationship between nutritional status and subjective fatigue in nurses at the hospital had different characteristics with variations in the number of samples whose size did not match the population, so in the end, they had an effect after the merger was carried out. The test results show low heterogeneity so that it uses fixed effect models in measuring the combined effect of the data in the data input model in the Revman 5.4 computer application. The results obtained were p -OR = 6.08 with a 95% confidence interval: 2.90 to 12.75. The combined effect also produces a Z value of 2.16 and a p value of <0.03 . Statistically, the combined effect is significant if the p value is <0.05 and this means that the null hypothesis is rejected, in other words there is a relationship between nutritional status and subjective fatigue in nurses at the hospital.

Two studies analyzed using Revman 5.4 can be seen that based on the funnel plot there is a bias value of moderate heterogeneity, namely 0%. This explains that the studies analyzed had a data variation that was not too wide where in the study it could be seen that the highest effect size was 7.39 (95% CI 2.26-24.23) and the lowest was 5.37 (95% CI 2.08-13.83), this explains that the variation of the data in the analyzed studies shows no significant difference. The higher the heterogeneity, the wider the confidence interval value and conversely the lower the heterogeneity value, the narrower the confidence interval value.

While the heterogeneity test of 5 research studies which stated that there was no relationship between nutritional status and subjective fatigue in nurses at the hospital showed a p value = 0.11 and an I^2 value (variation between studies) of 47% was declared homogeneous with. The variation of the 5 research studies had no effect on the total variation after the combined effect. These two studies have almost the same characteristics with variations in the number of samples, the size of which does not match the population but does not have a significant effect after the combination.

The results of the heterogeneity test show a homogeneous value so that the analysis uses fixed effect models in measuring the combined effect of the data in the data input model in the Revman 5.4 computer application. The results obtained are p -OR = 1.17 with a 95% confidence interval: 0.76 to 1.80. The combined effect also produces a Z value of 1.73 and a p value of <0.03 . Statistically, the combined effect is significant if the p value is <0.05 and this means that the null hypothesis is rejected, in other words there is a relationship between work nutrition status and subjective fatigue in nurses at the hospital.

The results of 5 studies analyzed using Revman 5.4 can be seen that based on the funnel plot there is a bias value for low heterogeneity levels. This explains that the studies analyzed had data variations that were not too wide where in the study it could be seen that the highest effect size was 8,500 (95% CI 0.9-206) and the lowest was 1.12 (95% CI 0.46-2.73), this explains that the variation of the data in the analyzed studies shows no significant difference. The higher the heterogeneity, the wider the confidence interval value and conversely the lower the heterogeneity value, the narrower the confidence interval value.

b. Analysis of Research Results

This study is the first meta-analysis study that analyzes the relationship between nutritional status and subjective fatigue in hospital nurses. Many studies have analyzed the between nutritional status and subjective fatigue in hospital nurses. For this reason, statistical analysis is carried out using meta-analysis to prove the quality of each study so that new quantitative data can be obtained and more accurate conclusions can be drawn.

The search results of journals from various sources in the end resulted in 39 studies relevant to the title and only 16 studies that matched the inclusion criteria and could be analyzed into meta-analysis using the Revman 5.4 application software. Even though in the end only 10 studies were obtained, the research could be continued using meta-analysis because according to Sastroasmoro (2011) in his book it states that meta-analysis is a combination of two or more studies. So it can be concluded that with a minimum of two studies, a quantitative analysis can be carried out using meta-analysis.

Both studies were analyzed by involving research samples from the total number of samples in each research study. For 2 research studies which stated that there was a relationship between work nutritional status and subjective fatigue on nurses in the hospital, the total sample was 151 samples. The results of the combined effect concluded that nutritional status was associated with work fatigue with a p value <0.00001 and p OR = 6.08 and a 95% confidence interval (2.90 to 12.75 on the funnel plot. It can be concluded that nutritional status has a relationship with fatigue. subjective to nurses in the hospital with a moderate level of relationship, where nurses with low nutritional status had a tendency to increase the risk of 5.45 times to experience subjective fatigue compared to nurses with good nutritional status.

The results of 5 research studies which stated that there was no relationship between nutritional status and subjective fatigue in nurses in the hospital with a total sample of 538 samples. The results of the combined effect concluded that nutritional status was not associated with work fatigue with a value of $p = 0.48$ and p OR = 1.17 and a 95% confidence interval (0.76 to 1.80;) on the funnel plot. The results of these research studies each state that the results have no relationship, and after conducting the combined analysis, the results still show no relationship with a p value >0.05 , namely $p = 0.48$. It can be concluded that nutritional status is not related to subjective fatigue in nurses at the hospital.

The results of the analysis for 2 research studies which stated that there was a relationship between nutritional status and subjective fatigue in nurses in the hospital after a combined analysis showed that there was a relationship with low heterogeneity data variations as well as 5 studies which stated there was no relationship after a combined analysis still showed no relationship. there is a relationship with moderate heterogeneity.

c. Comparison of Meta-analysis Results

Table 11. Comparison of Research Stating There is or Not a Relationship between Nutritional Status and Work Fatigue

Research variable	There is a relationship		No relationship	
	Heterogeneity Test	Result	Heterogeneity Test	Result
Nutritional status	P = 0.68 I2 = 0% (low heterogeneity)	6,08 (2.90-12.75)	P = 0.11 I2 = 47% (low heterogeneity)	1.17 (0.76-1.80)

Allo's research (2020) also states that nutritional status is related to work fatigue with a p-value = 0.001 which means there is a relationship. This is because the nutritional status of health and ability to work are closely related to a person's nutritional level because the body needs substances from food for body maintenance, repair of damaged cells, and damaged tissue. These nutrients are also needed for work and increase in proportion to the weight of a job. Someone who is malnourished or a BMI that exceeds normal will quickly feel tired when doing work. If the nutritional status is associated with fatigue, the nutritional status tends to be less prone to fatigue due to an imbalance in nutrient reserves which will be converted into energy during activities.

Research by Rizky et al (2018) states that nutritional status is related to work fatigue of nurses with a value of p = 0.001 which means there is a relationship. According to observations found in the field during research that most respondents have abnormal nutritional status, it is not certain that these respondents experience fatigue even though they have an abnormal nutritional status, but have a higher risk level than respondents who have normal nutritional status. According to Sumamur (2013), nutritional status when associated with fatigue, low nutritional status tends to be easier to experience fatigue due to limitations or imbalance of nutritional reserves which will be converted into energy during activities.

Research by Oksandi and Achmad (2020) states that nutritional status is related to work fatigue of nurses with a value of p = 0.038, which means there is a relationship. Nutritional status is one of the factors of work capacity, where malnutrition with a heavy workload will disrupt work and reduce efficiency and result in fatigue. The FAO / WHO / UNU report (1985) states that the Body Mass Index (BMI) is an indicator of the nutritional status of adults. The BMI value is calculated according to the science of body weight (in kilograms) divided by the square of height (in meters). General nutritional status specific to nutrients, but is more

closely related to energy and protein can be measured by anthropometry. In other words, anthropometry or body size can give a picture of a person's energy and protein status.

But the results of this study are not in accordance with the research conducted by Purnamasari D, et al (2020) where in this study it was stated that there was no relationship between nutritional status and work fatigue with a p-value = 0.571 which meant there was no relationship. This is in line with the results of research by Suwarni (2020) which also states that nutritional status is not related to work fatigue with a p-value = 0.484, which means that there is no relationship this is due to work fatigue, let alone heavy work fatigue, both of which are experienced by nurses who have more or normal nutritional status. Lack of nutritional value of food consumed by daily workers has bad effects on the body, such as decreased body defense against disease, decreased physical ability, decreased body weight, lack of enthusiasm and lack of motivation, reacted slowly and apathetically. In such circumstances, it cannot be expected to achieve optimal work efficiency and productivity. In carrying it out in the work process, a worker needs adequate sleep and balanced nutrition to be able to maintain work capacity. If the working capacity of a worker is well maintained due to adequate sleep and adequate nutrition, work fatigue that occurs can be minimized. In addition, the results of Elvianny's (2019) study also stated that there was no relationship between nutritional status and work fatigue with a p-value = 0.126. This is more experienced by nurses who have energy intake that does not match the RDA, namely 14 respondents (77.8%) compared to nurses who have low work fatigue as many as 4 respondents (22.2%). So it can be concluded that there is no significant difference between energy intake and work fatigue. OR value of 3,938, CI (0,911-17,014). This means that nurses with an energy intake that does not match the RDA have a 3,938-fold chance of experiencing high work fatigue. At least nurses with energy intake that does not match the RDA have a risk of 0.911 to 17, Research conducted by Trinofandy (2018) shows that there is no relationship between nutritional status and work fatigue with a p-value = 1.13 which means there is no relationship between nutritional status of nurses and subjective fatigue in nurses. In accordance with the observations found in the field during research that many nurses were found with body proportions that were not yet ideal. This may be due to several factors, such as eating less food, which tends to cause fatigue at work. Basically, with the fulfillment of nutritional needs and being in good health, it will be strong at work, especially if you have high morale, it will be able to increase work productivity but if it is less or excessive it will cause fatigue more quickly.

Research conducted by Saftarina (2020) shows that there is no relationship between nutritional status and work fatigue with a p-value = 0.944, which means that there is no relationship between nutritional status of nurses and subjective fatigue in nurses. Workers with good nutritional status will have a greater work capacity and increased endurance (and vice versa), while workers who are malnourished with a heavy workload will experience disruption in their work, will have lower levels of efficiency and resilience. at work, and will be more likely to fall ill and suffer accelerated work fatigue.

Researchers assess that nutritional status does not tend to be related to work fatigue, this can be seen from the results of the proportion of research articles that state there is no relationship between nutritional status and work fatigue and also if nurses have good nutritional status, the risk of work fatigue will also be smaller. According to the assessment of researchers, good nutritional status can provide a strong workforce and increase work productivity. Meanwhile, less nutritional status will experience faster work fatigue due to lack of food consumption.

Meta-analysis of the factors most associated with subjective fatigue in nurses in the hospital

Based on the results obtained in the Meta Analysis, it can be seen that the risk factors / tendencies associated with subjective fatigue in nurses at the hospital, the largest of the 2 variables studied is nutritional status because malnutrition status has a tendency to increase the risk of 6,080 times to cause subjective fatigue in nurses in Hospital is compared with nurses who have normal nutritional status in the hospital and after that high shift work increases the risk or tends to be 5.46 times causing subjective fatigue in nurses in the hospital compared to nurses who have low work shifts.

The ambience and demands of work in medical services demands speed, accuracy and care. The patient's condition from time to time may change unexpectedly. All of this requires concentration, attention, and alertness which must not become complacent and cut off. Nurses with malnutrition status will usually experience fatigue more quickly due to lack of fulfilled nutrition to produce energy while working, unfulfilled nutrition can also cause a person to become drowsy and less focused in carrying out their work so that it can affect the work done. This situation can cause nurse fatigue. With an erratic schedule it can make it easier for someone to make mistakes. Conversely, if the work shift has a regular schedule and the nurse is in good nutritional status,

Comparison between these two variables can be done, but it must be remembered that the comparison is not proportional because there is no similarity in the number of samples and characteristics in the research study of each variable studied in the meta-analysis as well as differences in the level of heterogeneity in each variable, causing differences in the selection of the analysis model used. .

V. CONCLUSION

1. There is a significant relationship between work shifts and subjective fatigue in nurses in the hospital through analysis of 3 eligible journals with a value of $p < 0.05$, namely $p < 0.00001$ and a pooled odds ratio of 5.46 (95% CI 2,71-11,2), so it can be concluded that nurses who have high work shifts have 5.46 times the risk of subjective fatigue compared to nurses who have low work shifts.
2. There is a significant relationship between nutritional status and subjective fatigue in nurses in the hospital through the analysis of 2 journals that meet the requirements with a value of $p < 0.05$, namely $p < 0.00001$ and a pooled odds ratio of 6.08 (95% CI 2,90-12,75), so it can be concluded that nurses who have low nutritional

status have 6.08 times the risk of subjective fatigue compared to nurses who have good nutritional status.

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