Systematic Review and Meta-analysis of Factors related to Functional Status of People with Liver Cirrhosis

Surachai Maninet, Yupin Aungsuroch, Chanokporn Jitpanya*

Abstract: Functional status decline is a frequent problem reported by people with liver cirrhosis. This causes difficulty maintaining defined tasks in terms of physical, psychological, social, and role functioning. Previous studies reported that several factors related to the functional status of people with liver cirrhosis. However, research results remain inconsistent, and the magnitude of relationships of each factor and functional status among people with liver cirrhosis is less likely to share information. Therefore, this study aimed to explore the pooled effect size of factors related to functional status of people with liver cirrhosis across studies. A systematic review and meta-analysis were conducted in 2021 utilizing PRISMA guidelines to report the study. Databases including Ovid, MEDLINE, CINAHL, Embase, PubMed, PsycINFO, Scopus, Science Direct, ProQuest, and Google Scholar were searched. The studies published from the establishment of each database to February 2021 were reviewed. The quality of the selected articles was evaluated utilizing the Newcastle-Ottawa Scale.

Ten studies met the inclusion criteria, involving a total of 1,189 participants. Existing variables were categorized into nonmodifiable and potentially modifiable factors. Age, severity of disease, and hemoglobin levels were the nonmodifiable factors that had moderate relation with functional status. For modifiable factors, illness perception and fatigue, were found to have a moderate association with functional status. The findings indicate that healthcare personnel should emphasize minimizing fatigue and negative illness perception to improve functional status among people with liver cirrhosis. Those with older age, severe disease, and a low level of hemoglobin are more vulnerable to functional status decline.

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Introduction

Functional status decline is a frequent problem reported by people with liver cirrhosis. When they are less capable of performing normal daily functioning, they would be at risk for suffering functional status decline.[1] Universally, the concept of functional status is defined as both a uni- and multi-dimensional construct. Researchers have defined this concept as the ability of the individual with liver cirrhosis to perform defined tasks in physical, psychological, social, and role functioning.[2,3]

Functional status decline is a frequent problem reported by people with liver cirrhosis. Prior studies report that approximately 60% of them faced functional status decline, causing difficulties in maintaining usual daily living activities (ADL).[3,4] For physical functioning, people with liver cirrhosis have trouble maintaining their ability to perform usual activities such as exercise, housework, dressing, grocery shopping, and driving.[5,6,7] For psychological functioning, they feel uncertain that their illness could not be controlled by themselves, which created many changes in their daily lives.[8] For social and role functioning, approximately 35% had decreased ability to normally perform, with difficulty in social functions and participating in activities they appreciated sharing with family and friends.[9] Persistent functional status decline among this population causes disease deterioration, unemployment, frequent hospitalization, decreased quality of life, and risk of death.[10,11,12] Worldwide, this problem places a significant burden on short-and long-term healthcare systems such as healthcare services utilization and the cost of medical expenditure.[13,14] Hence, declining functional status in this population becomes a serious aspect.

Although several studies have reported factors related to functional status among people with liver cirrhosis, the controversy of research results across studies in the literature exists. For example, some studies found that many nonmodifiable factors such as age, gender, education, hemoglobin, fasting glucose, and albumin level to be key factors of functional status among people with liver cirrhosis.[15,16,17,18] Conversely, a study conducted in 100 adult patients with cirrhosis revealed that age and gender were not found to predict functional status.[19] Another study also reported a significant inverse relationship between levels of functional status among men and women, regardless of age and marital status.[7] Furthermore, some studies have reported inconsistent results even invested the same variable. For example, fatigue was mildly associated with functional status[20], while several researchers reported that fatigue was moderately related to functional status among this population.[7,16,21] Contradictions among empirical evidence may be due to many reasons, the heterogeneity in sampling technique used, study design, sample demographics, or the instruments used in a study. These barriers impede nurses and other healthcare providers from understanding and developing specific interventions that could improve the functional status of people with liver cirrhosis. Thus, further analysis to draw a convincing conclusion from these studies is required.

A systematic review and meta-analysis was needed to draw a valid conclusion about factors associated with functional status in this patient group, detect variability and produce a more precise estimate of the association between existing factors and functional status. We could not find a published article that had synthesized such factors or reported on the effect size estimates for the existing factors and functional status.

Our research question was: *"What is the magnitude of the correlation between existing independent variables and functional status of people with liver cirrhosis?"* Three key elements were important to include to answer this question: 1) Population = people with liver cirrhosis, 2) Independent variables = factors, and 3) Outcome = functional status. The findings of this review will assist nurses and other healthcare providers to understand the causes of functional status decline and thus improve clinical decision-making about appropriate nursing and other health interventions.

Study Aim

To explore the pooled effect size of factors related to functional status among persons with liver cirrhosis across studies in the literature

Methods

Design: A systematic review and meta-analysis was conducted and reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement guidelines[22] to report the findings.

Search methods: The literature search was conducted from January-February 2021. We reviewed the studies published in English and Thai language

from the establishment of each database to February 2021. The databases were Ovid, MEDLINE, CINAHL, Embase, PubMed, PsycINFO, Scopus, Science Direct, ProQuest, and Google Scholar databases. Search terms were used were: 1) population as "cirrhotic patients" or "chronic liver disease," 2) factors as "factors" or "protective factors" or "behavioral factors" or "predictor" or "determinant," 3) outcome as "functional status" or "functional capacity" or "functioning" or "activities of daily living," and 4) type of study as "correlate" or "association*" or "predictor*" or "regression" or "relationship*" or "multivariate analysis."

Inclusion and exclusion criteria: The inclusion criteria were studies that: 1) were original full articles written in English or Thai, 2) quantitative studies that focused on the correlation between the independent variable(s) and functional status in people with liver cirrhosis, 3) providing sufficient data for calculation of correlation between independent variables and functional status such as *t, F,* x^2, and sample size, 4) enrolled participants ≥18 years old, and 5) no limitation in publication date. The exclusion criteria were: 1) qualitative studies, review papers, letters, editorials, and pooled analysis, 2) where no full text was available, 3) grey literature such as conference abstracts/proceedings or unpublished dissertation and thesis, and 4) those where the study quality received an inadequate assessment using the criteria of the Newcastle-Ottawa Scale (NOS).

Search outcomes: Two reviewers searched and screened abstracts and full texts of all potential studies independently. The articles were selected for the study hinging on inclusion criteria. The rationales to exclude any article was recorded. The potential studies found in this step were 473 articles. Seventeen articles were selected for full-text review and only 12 studies were then included for data extraction. Finally, ten studies remained enough data for conducting meta-analysis. The process of study selection is shown in **Figure 1**.

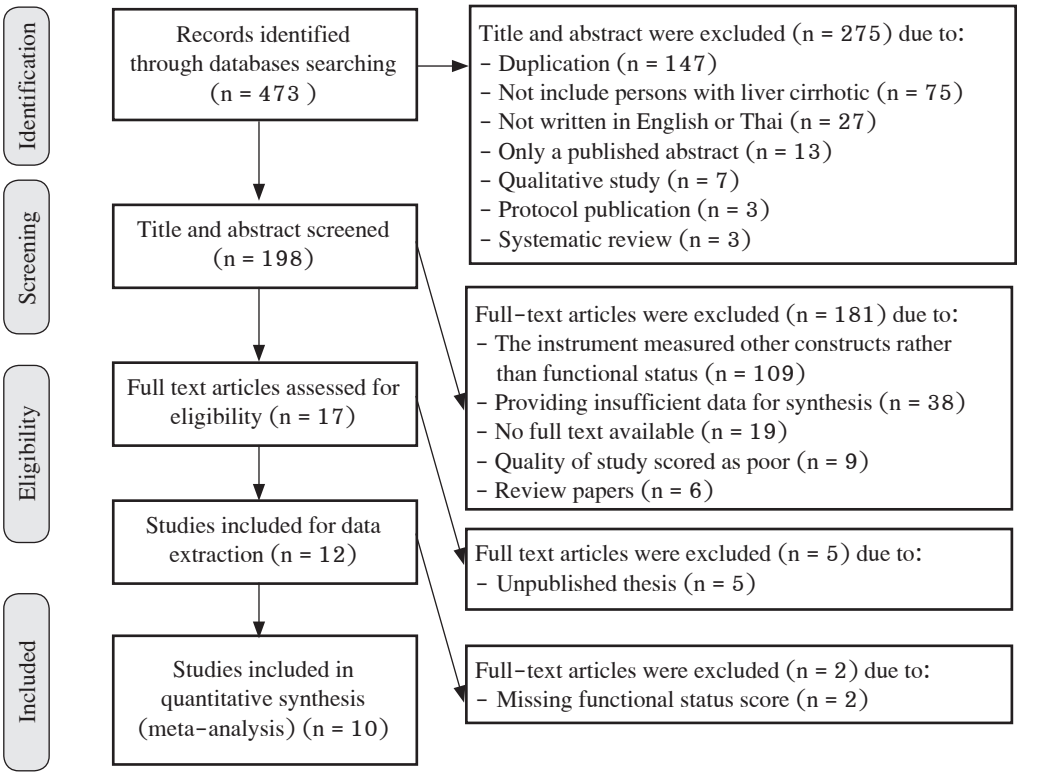


Figure 1 PRISMA flow diagram of study selection

Quality appraisal: Each included article's quality was assessed using the Newcastle-Ottawa Scale (NOS).[23] Although the original version of NOS was developed to assess the methodological quality of cohort and case-control studies,[23] researchers also recommended using the NOS to evaluate the methodological quality in descriptive studies such as correlational studies and cross-sectional studies.[24] In addition, the validity and reliability of this scale have been reported elsewhere.[24] Scores of the NOS were considered as low, moderate, and high.[23] Only articles with at least moderate quality were included in the study. Eventually, ten studies were qualified to conduct a meta-analysis due to the quality assessment score recorded as moderate to high quality.

Data extraction: A data extraction form was developed based on the consensus among reviewers. Data were extracted regarding the study design, methods, participant characteristics, sample size, type of functional status scale, independent and dependent variables investigated, and correlational values. Two reviewers recorded the data independently. The accuracy of the extracted data was subsequently assessed and confirmed by a third reviewer. This study did not contact the original authors for clarification of any missing of relevant information.

Data synthesis and analysis: The general characteristics of selected studies were summarized descriptively. A meta-analysis was performed utilizing the R statistical software program for all statistical analyses. Correlation values were considered in effect size (ES) measure and converted to a standardized unit with Fisher r to z transformation and conversion back to r method.[25] To assess the heterogeneity between studies, the Cochran's Q test and I^2 statistics were used. For Q test, a random effect model was considered when p-values were < 0.1. To describe the percentage of variation across included studies, I^2 statistic was considered regarding these criteria: low heterogeneity (25%), medium heterogeneity (50%), and high heterogeneity (75%).[26]

A funnel plot was produced to investigate the publication bias in the studies. Publication bias was assessed using the Egger test with a p-value less than 0.05 was considered statistically significant. The correlation coefficient (r) strength was tested by considering the following criteria: small correlation (< 0.25), fair correlation (0.25 to < 0.50), moderate to good correlation (0.50 to < 0.75), and excellent correlation (≥ 0.75).[27] A $p < 0.05$ was considered statistically significant.[28]

Results

Characteristics of the recruited studies

A summary of the main characteristics of all the studies included is shown in **Table 1.** The total sample size was 1,189 participants (ranged 40 – 286), the mean age was 52.71 years (range 41.60 – 63.30), and the sample was mostly male (80.30%). The mean of the data collection period was 19 months (ranged 10 – 36). The selected studies were published from 2005 to 2018. Most studies collected the data at the out-patient department when visiting the doctor for monitoring health conditions (n = 9, 90%).[7,16-18,20,21,29,30, 32] The severity of disease was assessed using the Child-Pugh Class (n = 2 studies)[7,17] and the model for end-stage liver disease score (n = 1 study).[29]

In measuring the functional status, three studies used the Six-Minute Walk Test.[17,18,29] Seven different scales were found including: 1) Human Activity Profile[20], 2) International Physical Activity Questionnaire[30], 3) Inventory of Functional Status-Cancer,[16] 4) Patient-Reported Outcomes Measurement Information System,[21] 5) RAND 36-Item Health Survey,[31] 6) Seven-day Physical Activity Recall,[7] and 7) EORTC Core Quality of Life Questionnaire.[32]

Table 1 Characteristics of all selected studies for conducting meta-analysis

Authors/Year /Country/Setting	Study design	Characteristics of participants					Outcome assessed	Tools used	NOS
		Sample size	age (SD)	Age ranged	Gender: M/F	Severity of disease assessed			
Kotarska et al.[30] /2014/Poland/ OPD	Correlational study	107	46.7 (11.6)	17-63	62/45	NR	Physical functions	IPAQ	4
Galant et al.[29] /2012/Brazil/ OPD	Cross-sectional study	86	54.3 (9.7)	NR	64/22	Model for End Stage Liver Disease	Functional status	6-MWT	6
Park and Lee[16] /2005/Korea/	Correlational study	182	42.4 (NR)	NR	135/47	NR	Daily living activities	IFS-CA	4
Wu et al.[7]/2011/ Taiwan/OPD	Correlational design	40	63.3 (14.0)	29-80	31/9	Child-Pugh class A/B/C	Physical activity	7-day PAR	5
Alameri et al.[17] /2007/Saudi Arabia/ OPD	Prospective study	98	57 (12.0)	NR	64/34	Child-Pugh Class	Functional capacity	6-MWT	5
Weinstein et al.[20] /2017/USA/ OPD	Prospective study	106	50.9 (9.7)	NR	53/53	NR	Physical activity	HAP	6
Loria et al.[18] /2014/USA/ OPD	Prospective and cohort study	51	51 (9.0)	NR	33/18	NR	Physical performance	6-MWT	6
Elliott et al.[21] /2013/UK/ OPD	Correlation and predictive study	211	60 (10.0)	NR	75/32	NR	Functional ability	PHAQ	5
Langston et al.[31] /2018/Australia/ Home	Correlation and predictive study	126	41.6 (11.9)	NR	68/58	NR	Physical health	RAND-36	6
Fan et al., 2017/ OPD/Taiwan[32]	Cross-sectional study	286	59.85 (12.2)		218/68	NR	Physical functioning	EORTC QLQ-C30	6

Notes: SD = Standard deviation, M = Male, F = Female, NOS = Newcastle-Ottawa Scale, OPD = Out-patient department, NR = Not reported, IPAQ = International Physical Activity Questionnaire, MQ = Moderate quality, 6-MWT = Six-Minute Walk Test, HQ = High quality, IFS-CA = Inventory of Functional Status-Cancer, 7-day PAR = Seven-day Physical Activity Recall, HAP = Human Activity Profile, UK = United Kingdom, PHAQ = Physical Ability Health Assessment Questionnaire, RAND-36 = RAND 36-Item Health Survey, EORTC QLQ-C30 = EORTC Core Quality of Life Questionnaire.

Factors related to functional status

Across ten studies included,[7,1-18,20,21,29,30,31,32] there were 21 variables related to functional status existing in the literature. These 21 variables were categorized into nonmodifiable and modifiable factors. After conducting the Fisher Z-Transformation, the correlation values between each variable and functional status are shown in **Table 2**.

Table 2 Transformed correlation coefficients of factors related to functional status of people with liver cirrhosis

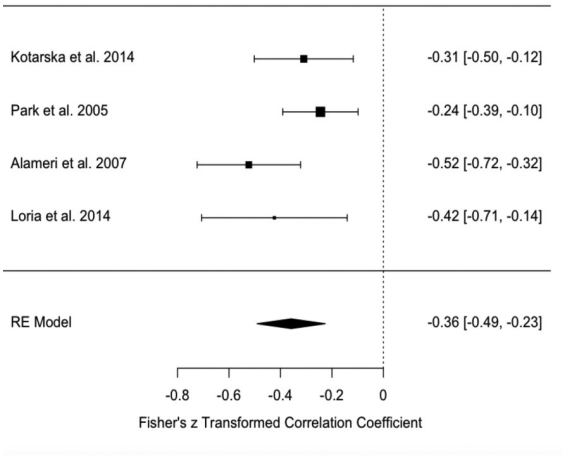
Factor	Variable	Correlation coefficient (r)	Reference
Nonmodifiable factors	Age	-0.24, -0.30, -0.40, -0.48	16, 30, 18, 17
	Gender	0.32	7
	Height	0.28	17
	Marital status	0.39	7
	Educational level	0.34	16

Table 2 Transformed correlation coefficients of factors related to functional status of people with liver cirrhosis (Cont.)

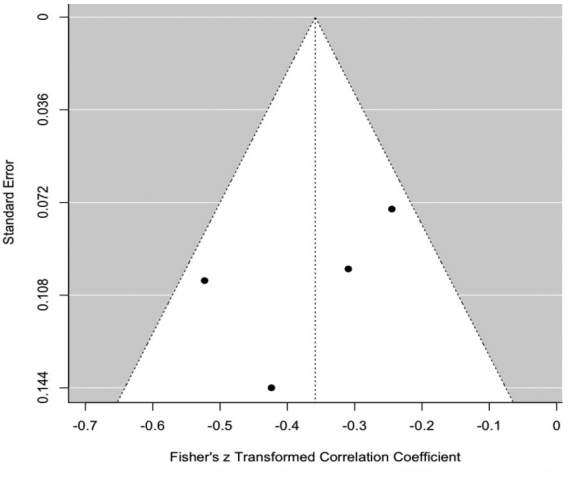
Factor	Variable	Correlation coefficient (r)	Reference
	Severity of disease	-0.33, -0.56	17, 29
	Alkaline phosphatase	0.20	21
	Body mass index	-0.17	30
	Hemoglobin levels	0.32, 0.37	7, 17
	Hematocrit levels	0.39	7
	White blood cell counts	0.32	7
	Albumin level	0.31	17
	Fasting glucose	0.43	18
	Heart rate	-0.32	18
Modifiable	Illness perception	-0.47, -0.50	31, 32
factors	Social support	0.26	16
	Daytime sleepiness	-0.25	21
	Fatigue	-0.34, -0.30, -0.40, -0.45	7, 20, 21,16
	Symptoms	0.31	16
	Autonomic symptoms	0.40	21
	Cognitive symptoms	0.40	21

A meta-analysis of the factors related to functional status

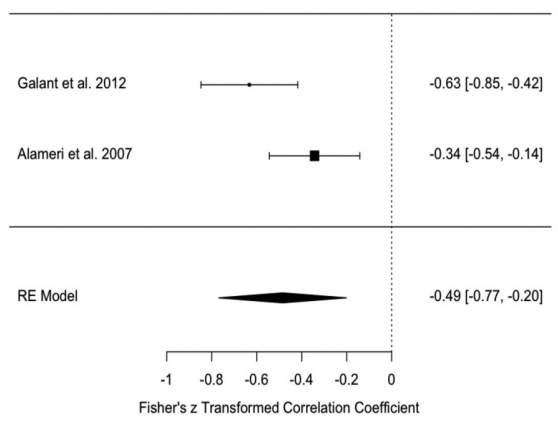
Ten studies met inclusion criteria for conducting meta-analysis.[7,16,17,18,20,21,29,30,31,32] This study found that all factors related to functional status as fair to moderate correlation. According to the methods of Egger's and Begg's tests, publication bias was not significantly found across studies included. **Figure 2** demonstrates the respective forest plots describing the pooled estimates, confident intervals (CIs), and funnel plots for each association.



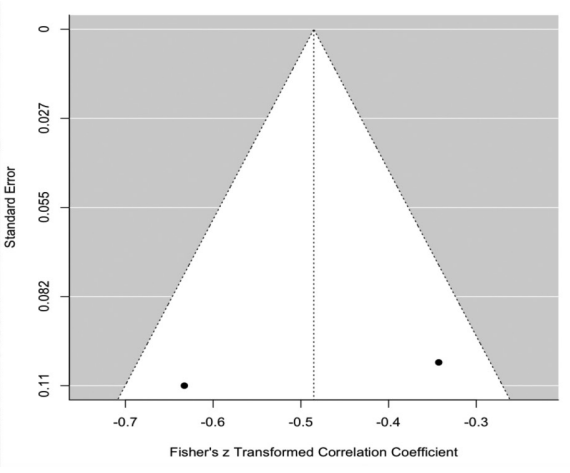
(a.1) Forest plot for age and functional status



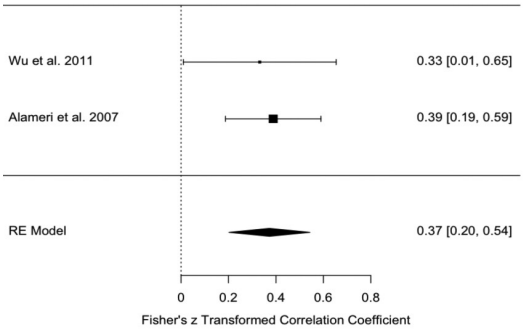
(a.2) Funnel plot for age and functional status



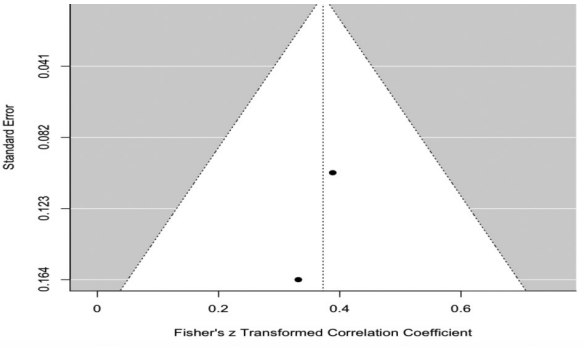
(b.1) Forest plot for the severity of disease and functional status



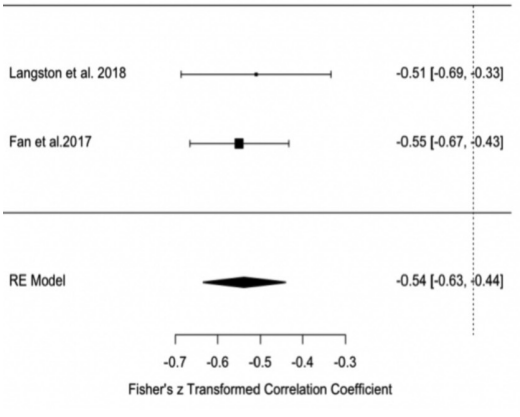
(b.2) Funnel plot for the severity of disease and functional status



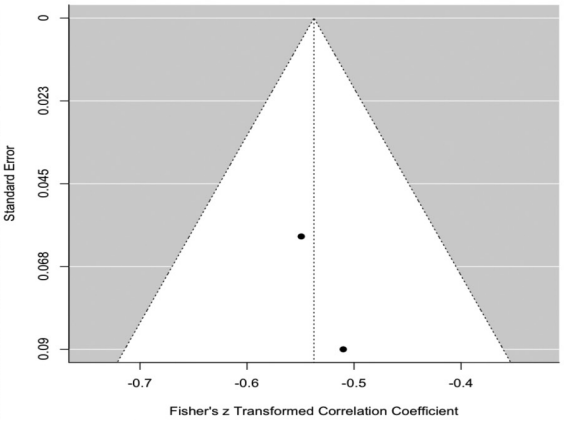
(c.1) Forest plot for hemoglobin and functional status



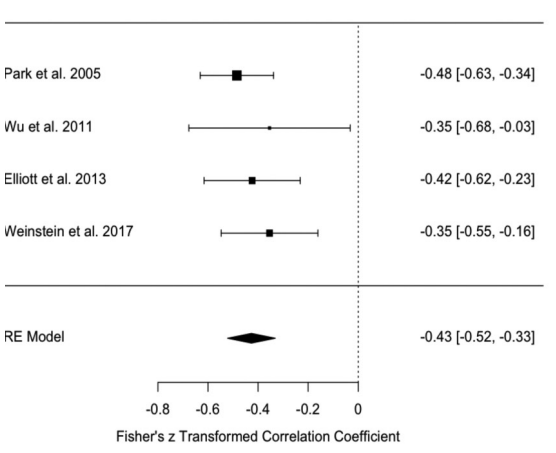
(c.2) Funnel plot for hemoglobin levels and functional status



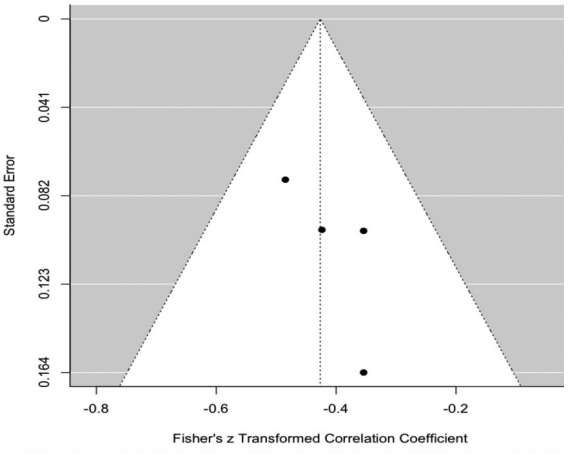
(d.1) Forest plot for illness perception and functional status



(d.2) Funnel plot for illness perception and functional status



(e.1) Forest plot for fatigue and functional status



(e.2) Funnel plot for fatigue and functional status

Figure 2 Meta-analysis of correlation

For non-modifiable factors, 4 studies[16,17,18,30] investigated the relationships between age and functional status which found negative associations ranged from r = -0.24 to -0.48. Pooled results from these 4 studies (n = 438) were obtained for the meta-analysis showed a moderate relation between age and functional status (effect size: ES [z] = -0.36, 95% CI -0.49 to - 0.23). Two studies[17,29] reported that severity of disease was correlated with functional status. The pooled results from these 2 studies (n = 184) demonstrated a moderate relation between severity of disease and functional status (ES [z] = -0.49, 95% CI -0.77 to -0.20). In addition, 2 studies[7,17] found that hemoglobin levels were positively correlated to functional status ranged from 0.32 to 0.37. Pooled data from these 2 studies (n = 138) shown a moderate relation between hemoglobin levels and functional status (ES [z] = 0.37, 95% CI 0.20 to 0.55).

For modifiable factors, illness perception was negatively correlated to functional status ranged from -0.47 to -0.50.[31,32] Data were pooled (n = 412) and demonstrated a moderate correlation between illness perception and functional status (ES [z] = -0.54, 95% CI -0.62 to -0.44). Furthermore, 4 studies[7,16,20,21] revealed that fatigue negatively correlated with functional status ranged from -0.340 to -0.450. Pooled results from these 4 studies (n = 435) reported a significant correlation with a moderate relation to functional status (ES [z] = -0.43, 95%CI -0.52 to -0.33).

The results of the meta-analysis of weighted effect sizes regarding factors related to functional status in persons with liver cirrhosis are shown in **Table 3.**

Table 3 A meta-analysis of weight effect sizes of factors related to functional status among persons with liver cirrhosis (Random-Effects Model)

Study variables	Study (n)	Sample size (n)	Effect size	95% confidence interval	Q-statistics	I^2-value (%)	References
Age	4	438	-0.36	-0.49 to -0.23	5.533	44.61	16,17,18,30
Severity of disease	2	184	-0.49	-0.77 to -0.20	3.726	73.16	17,29
Hemoglobin levels	2	138	0.37	0.20 to 0.54	0.086	0.00	7,17
Fatigue	4	435	-0.43	-0.52 to -0.33	1.341	0.00	7,16,20,21
Illness perception	2	412	-0.54	-0.63 to -0.44	0.132	0.00	31, 32

Discussion

This systematic analysis and meta-analysis pooled data across ten studies to estimate the effect size regarding factors related to functional status among people with liver cirrhosis. There were 21 factors associated with functional status. These were categorized into two groups called nonmodifiable and potentially modifiable factors.

Among the nonmodifiable factors, this study found that age was negatively related to functional status. This indicates that people with older ages would suffer from functional status decline. Similarly, studies have found significant associations between age and physical functioning in patients living with chronic liver disease.[33,34] The severity of the disease was found to be negatively correlated with functional status. The pathophysiology of the liver could explain this, that the more injured the liver, the more liver function becomes an uncompensated condition. Thus, it affects various aspects of life, including physical, psychological, role, and social functioning in patients with liver cirrhosis.[33,35,36,37,38] In contrast, hemoglobin level was found positively associated with functional status. This finding suggests that increasing hemoglobin levels would improve levels of functional status among people with liver cirrhosis. Likewise, previous studies reported similar results that normal level of hemoglobin was correlated with greater functional status in people with chronic liver disease.[15,34,39]

Among modifiable factors, fatigue demonstrated a consistent negatively associated with functional status. This finding illustrates that fatigue and decreases functional status are common health concerns among people with liver cirrhosis. Previous studies supported that fatigue is a major independent variable of functional status among patients with liver cirrhosis.[40,41] This may be related to the long-term inflammation either causing or resulting from liver cirrhosis contributing to fatigue.[41] For illness perception, this study found a negative association between illness perception and functional status. These results are consistent with the study of Untas and colleagues[42] who demonstrated that people with primary biliary cirrhosis felt that their progression of disease, symptoms, and perception about their illness significantly related to worse physical, emotional, and social functioning. Therefore, these variables should be critically emphasized that effective fatigue reduction and enhancing positive illness perception programs would improve functional status levels among people with liver cirrhosis.

Regarding to the results of this study, we also found that more than half the selected studies (n = 6) used research instruments that measured only one dimension (physical functioning) of functional status such as the Six-Minute Walk Test,[17,18,29] Seven-day Physical Activity Recall,[7] Human Activity Profile,[20] and International Physical Activity Questionnaire.[30] Other studies defined and measured functional status as a multi-dimensional construct.[16,21,31,32] The explanation about this issue is given that functional status can be difficult to measure because there is no consensus definition. Although several research instruments have been developed to measure functional status, inconsistency regarding its dimensions is still occurs. Therefore, the study findings should be cautiously interpreted.

Limitations

This study has a few limitations. Selection of the literature that was published only in English and Thai language may limit the generalizability of the findings. In addition, few studies were included in this meta-analysis which may limit the strengths of the findings.

Conclusion

In conclusion, this study identified all available factors related to functional status among people with liver cirrhosis based on the findings from the

quantitative study approach. According to the meta-analysis results, people with liver cirrhosis who have older age, serious severity of disease, low level of hemoglobin, fatigue, and negative illness perception are more vulnerable to functional status decline. Future studies should explore more robust factors that can be able to develop a personalized intervention plan for people with liver cirrhosis.

Implications for clinical practice

The findings of this study are relevant to clinical practice. Understanding the factors of functional status in people with liver cirrhosis provides valuable information which enables nurses and associated healthcare personnel to plan for effective intervention to improve functional status among this population. For example, people with liver cirrhosis can suffer from severe fatigue which may decrease the level of functional status. Therefore, early detection of the level of fatigue and functional status should be done by nurses and physicians. Growing evidence suggests that performing exercise combined with aerobic and resistance training could decrease fatigue among patients with chronic liver disease.[45] For people with liver cirrhosis, better-designed clinical trials to explore the role of exercise and functional status is needed in further study. Furthermore, the intervention should include using effective information when educating people with liver cirrhosis by providing an opportunity for them to express their feelings about the diagnosis, prognosis, treatments, and unpleasant symptoms to understand their perception of living with liver cirrhosis.

To minimize negative illness perception among people with liver cirrhosis, healthcare personnel should assess their perception about living with this disease regularly. In cases where patients viewed liver cirrhosis as a life-threatening disease, doctors should cooperate with nurses to help them deal with the disease and manage unpleasant symptoms. Teaching doctors and nurses to discuss and adjust unhelpful illness perceptions in people with liver cirrhosis would help to strengthen their beliefs and lessen adjustment problems. In addition, interventions aimed at forming an appropriate perception of liver cirrhosis may improve functional status.

A comprehensive model of assessment looking at an older age increased the severity of disease, and abnormal hemoglobin levels could potentially decrease levels of the functional status of people with liver cirrhosis. This reinforces the role of nurses and physicians to quantify the personal information and results of the blood test before delivering the intervention that aim to improve functional status. For further research, a better understanding of a causal relationship among found factors in this study before developing interventions for enhancing functional status is needed. Since there is no consensus about the definition and the specific instruments to assess functional status, more studies are needed to define this concept which would help capture the holistic picture about the functional status of people with liver cirrhosis. The development of a disease-specific measure in assessing the functional status of people with liver cirrhosis is needed.

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การทบทวนวรรณกรรมอย่างเป็นระบบและการวิเคราะห์อภิมานปัจจัยที่สัมพันธ์กับภาวะการทำหน้าที่ ของบุคคลที่เป็นโรคตับแข็ง

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บทคัดย่อ: การลดลงของภาวะการทำหน้าที่เป็นปัญหาสำคัญของบุคคลที่เป็นโรคตับแข็ง เป็นสาเหตุที่ทำให้บุคคลเหล่านี้มีความยุ่งยากในการทำกิจกรรมทางด้านร่างกาย จิตใจ สังคม และบทบาทของตนเอง จากการทบทวนวรรณกรรมในอดีตพบว่ามีหลายปัจจัยที่มีสัมพันธ์กับภาวะการทำหน้าที่ของบุคคลที่เป็นโรคตับแข็ง แต่ยังพบความไม่สอดคล้องกันและยังไม่มีข้อสรุปที่ชัดเจนระหว่างความสัมพันธ์ของปัจจัยเหล่านั้นกับภาวะการทำหน้าที่ของบุคคลที่เป็นโรคตับแข็ง การศึกษาครั้งนี้จึงมีวัตถุประสงค์เพื่อหาผลรวมขนาดอิทธิพลของปัจจัยต่าง ๆ ที่สัมพันธ์กับภาวะการทำหน้าที่ของบุคคลที่เป็นโรคตับแข็ง รูปแบบการศึกษาคือการทบทวนวรรณกรรมอย่างเป็นระบบและการวิเคราะห์อภิมาน โดยใช้แนวทางการทบทวนวรรณกรรมอย่างเป็นระบบของ The Preferred Reporting Items for Systematic Reviews and Meta-Analysis สืบค้นจากฐานข้อมูล Ovid, MEDLINE, CINAHL, Embase, PubMed, PsycINFO, Scopus, Science Direct, ProQuest, และ Google Scholar เป็นงานวิจัยที่ได้รับการตีพิมพ์นับตั้งแต่การจัดตั้งของแต่ละฐานข้อมูลจนถึงเดือนกุมภาพันธ์ ปี ค.ศ. 2021 คุณภาพของงานวิจัยประเมินโดยเครื่องมือมาตรฐานของ Newcastle-Ottawa Scale

งานวิจัยจำนวน 10 เรื่องได้รับการคัดเลือกเพื่อการวิเคราะห์ข้อมูลเนื่องจากมีคุณสมบัติครบตามเกณฑ์การคัดเข้า กลุ่มตัวอย่างเป็นบุคคลที่เป็นโรคตับแข็งจำนวน 1,189 คน ปัจจัยที่ค้นพบทั้งหมดถูกจำแนกออกเป็น 2 กลุ่ม ได้แก่ กลุ่มปัจจัยที่ไม่สามารถจัดกระทำได้และกลุ่มปัจจัยที่สามารถจัดกระทำได้ โดยปัจจัยที่ไม่สามารถจัดกระทำได้ ได้แก่ อายุ ความรุนแรงของโรค และระดับฮีโมโกลบินในกระแสเลือดมีความสัมพันธ์ระดับปานกลางกับภาวะการทำหน้าที่ ส่วนปัจจัยที่สามารถจัดกระทำได้ ได้แก่ การรับรู้เกี่ยวกับความเจ็บป่วย และความเหนื่อยล้า มีความสัมพันธ์ในระดับปานกลางกับภาวะการทำหน้าที่ ผลการศึกษาในครั้งนี้ชี้ให้เห็นว่าบุคคลากรทางสุขภาพควรให้ความสำคัญกับการจัดการความเหนื่อยล้าและการรับรู้เกี่ยวกับความเจ็บป่วยในทางลบเพื่อเพิ่มระดับภาวะการทำหน้าที่ของบุคคลที่เป็นโรคตับแข็ง นอกจากนี้ ความสูงอายุ การมีระยะของโรคที่รุนแรง และฮีโมโกลบินในกระแสเลือดอยู่ในระดับต่ำ เป็นปัจจัยที่สำคัญที่ทำให้ภาวะการทำหน้าที่ลดลงเช่นกัน

Pacific Rim Int J Nurs Res 2021; 25(4) 639-652

คำสำคัญ : ความเหนื่อยล้า ภาวะการทำหน้าที่ การรับรู้ความเจ็บป่วย โรคตับแข็ง การวิเคราะห์อภิมาน การทบทวนวรรณกรรมอย่างเป็นระบบ

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