International Journal of Physiotherapy and Research,
Int J Physiother Res 2021, Vol 9(4):3960-67. ISSN 2321-1822
DOI: https://dx.doi.org/10.16965/ijpr.2021.158

Original Research Article

Correlation between Sleep Quality & Functional Capacity in Hospitalized Coronary Artery Bypass Grafting Patients

Hetal M Mistry [1], Gayatri S Jere *[2].

[1] Associate Professor, School of Physiotherapy, T.N. Medical College & B.Y.L. Nair CH hospital, Mumbai, Maharashtra, India.

[*2] PG student, School of Physiotherapy, T.N. Medical College & B.Y.L. Nair CH hospital, Mumbai, Maharashtra, India.

ABSTRACT

Background: Coronary Artery Bypass Grafting (CABG) is a standard surgical intervention to restore normal blood flow to an obstructed coronary artery. Alterations in sleep patterns are common during recovery after cardiac surgery. Functional Capacity is an important dimension of human functioning, and also a well-documented concern for cardiac surgery patients throughout recovery.

Objective: To find the correlation between Sleep Quality and Functional Capacity in Hospitalized Coronary Artery Bypass Grafting Patients.

Study Design: cross- sectional, observational, correlation study

Method: 40 hospitalized CABG patients who fulfilled the inclusion criteria and were willing to participate. After obtaining the written consent, the participants were administered Pittsburgh Sleep Quality Index (PSQI) and made to performing 6 Minute Walk Test (6MWT) in the Cardio-Vascular & Thoracic Surgery (CVTS) wards. The time required was 30-40 minutes per participant.

Results: Spearman Ranks Correlation was used to find correlation between Sleep Quality and Functional Capacity. It was observed that there is a strong negative correlation between Global Score of Pittsburgh Sleep Quality Index (Sleep Quality) and Percent predicted value of 6MWT (Functional Capacity) with a r value of -0.7301 statistically significant with a p value of 0.0001. Higher the Score on Pittsburgh Sleep Quality Index (PSQI) lower was the Functional Capacity.

Conclusion: The results of this study showed strong correlation between Sleep Quality and Functional Capacity. Sleep quality should be considered as one of the important components of cardiac rehabilitation to improve the functional capacity of these patients.

KEY WORDS: CABG, Sleep Quality, Functional Capacity.

Address for correspondence: : Dr. Gayatri S Jere. PT., PG student, Physiotherapy School and Centre, T.N. Medical College & B.Y.L. Nair CH hospital, Mumbai, Maharashtra, India.
E-Mail: gayatrijere5@gmail.com

Access this Article online	Journal Information
Quick Response code	**International Journal of Physiotherapy and Research** ISSN (E) 2321-1822 | ISSN (P) 2321-8975 **https://www.ijmhr.org/ijpr.html** **DOI-Prefix:** https://dx.doi.org/10.16965/ijpr
DOI: 10.16965/ijpr.2021.158	**Article Information** Received: 13 Jun 2021 Accepted: 03 Aug 2021 Peer Review: 14 Jun 2021 Published (O): 11 Aug 2021 Revised: 12 Jul 2021 Published (P): 11 Aug 2021

INTRODUCTION

Sleep is defined as "a condition of body and mind which typically recurs for several hours every night, in which the nervous system is inactive, the eyes closed, the postural muscles relaxed, and consciousness practically suspended" [1]. Sleep quality is defined as the subject's satisfaction with sleep experience,

integrating domains of sleep initiation, maintenance, quality and refreshment about awakening [2].

While sleeping, most of the body's systems are in an anabolic state, helping to revive the nervous, immune, skeletal, endocrine and muscular systems; this is often an important process that maintains mood, memory, and cognitive function, and plays a large role in wound healing and restoration [3].

According to Pei-Lin (2015), 82.8% of the participants had poor sleep quality in the first week post hospitalization after coronary artery bypass grafting [4-6]. Coronary Artery Bypass Grafting (CABG) is a standard surgical intervention to revive normal blood flow to an obstructed coronary artery [7].

Following CABG, there is a lot of pain, fatigue, discomfort and wound healing, which are all stressors that heighten the need for sleep. Additionally, some patients are required to engage in bed rest so that their condition can be monitored [4]. Getting optimum level of sleep early after CABG is difficult due individual (age, gender), physiological (cardiac function, pain, dyspnoea, fatigue, nocturia), psychological and environmental (hospital environment, patient care activities) factors [4,5,8].

It is observed that the Functional Capacity is significantly reduced after cardiac surgery. [6] This is due to reduced respiratory and peripheral muscle strength, respiratory limitations post sternotomy, inactivity, incisional pain, fatigue, perceived exertion and emotional factors like anxiety and depression [6,9].

The ability of the body to utilize oxygen is called as the Functional capacity. The tool to measure Functional Capacity is 6 Minute Walk Test (6MWT) [9]. The 6MWT is a submaximal, self-paced, practical and simple test that assesses the general and combined responses of all the systems involved during exercise, including the cardiovascular and respiratory systems, systemic and peripheral circulation, neuromuscular system, and muscle metabolism [10,11].

According to Daniel da Costa Torres et al. (2016) and Claudia Fiorina et al. (2007), 6MWT was feasible and well tolerated after 7th day and 9 $\pm$ 2 post-operative days in CABG patients respectively [12,13].

Sleep disorders may affect the functional capacity causing fatigue and weakness and resulting in a vicious circle of poor health status and worsening prognosis [14]. There are a lot of studies focused on postoperative psychological, physical, social or adaptive distress in CABG patients but very few have focused specifically on sleep quality, and therefore the role it plays on functional capacity. Hence the purpose of this study is to find if there is any correlation between Sleep Quality and Functional Capacity in patients hospitalized post CABG.

METHODOLOGY

This is a Cross-Sectional, Correlational, Observational study conducted in Cardio Vascular and Thoracic Surgery wards at a Tertiary Care Hospital, Mumbai. Permission was taken from Head of Cardio-Vascular and Thoracic Surgery (CVTS) Department and approval was sort from the ethics committee and synopsis committee before starting the study.

40 patients between the age of 40-60 years, having BMI between 20-30 kg/m^2 undergone first elective uncomplicated CABG (early phase) were included in the study. Participants having any major Psychological, Respiratory, Neurological, Systemic Condition, haemodynamically unstable, Surgical reintervention, Auditory-visual impairments, needing walking aids for ambulation, Post-operative Left ventricular ejection fraction (LVEF) <35% or >54%, On Sleep medications were excluded from the study. Participation in this project was voluntary. They were allowed to withdraw for any reason (or no reason at all), at any time, without penalty of any sort. Since the study is in hospitalized patients, participants who had undergone surgery 7- 10 days ago were included.

Socio demographic data was collected, using the Case Record Form which included basic personal information, anthropometric measures, vital parameters, co-morbidities and information regarding current medication of

the participants.

Sleep quality of participant was assessed using the Pittsburgh Sleep Quality Index. It consists of 19 items, each scored between 0 and 3. The index consists of seven subscales evaluating subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction. Component 6 of PSQI, use of sleep medications, score was zero for all participants, as sleep medications were excluded from the study. A global PSQI score which ranges between of 0 to 21 was calculated. Good sleep quality is represented by a global PSQI score of ≤ 5 while poor sleep quality is represented by a global PSQI score of >5. Higher the score, poor is the sleep quality [15]. Permission to use the scale was granted by the author. Instructions were given to the patients to rate their sleep quality post CABG surgery day. The scale was administered in Marathi, Hindi, English. Patients were requested to fill the Pittsburgh Sleep Quality Index (PSQI).

Following this, vitals of the participants were measured and the participant was then be made to perform a six-minute walk test on the same day. 6 Minute walk test (6MWT) is a tool to evaluate functional capacity. Functional Capacity is calculated by calculating the Percent predicted value of 6MWT. Predicted values using reference equation given by Ramanathan et al. were used [16]. The 6-MWT was conducted using a standardized procedure according to the American Thoracic Society [17]. It is a safe, reliable, submaximal, symptom limited test.

The participant was under observation throughout. Vitals were measured immediately, after 1 minute, 3 minutes and 6 minutes of completion of test.

Statistical analysis:

Data was analysed using GraphPad Prism Software Version 8.4.3 (10th June 2020). The data was checked for normality using the Shapiro-Wilk Test as it is sensitive for smaller sample sizes (n<50). The data did not pass normality; thus, non- parametric test, Spearman rho Correlation test was performed. The confidence interval was set as 95% and significance level was set as 0.05. The data was considered as significant if $p<0.05$.

RESULTS

40 Subjects, hospitalized post CABG, meeting the inclusion criteria and willing to participate were recruited in this study. The study consisted of 27 (67.50%) males and 13 (32.50%) females with a mean age of 53.23 $\pm$ 6.257 years and BMI of 24.36 $\pm$ 2.102 kg/m^2. Out of these, 45 % participants were assessed on the 7th post-operative day, 40% on 8th post-operative day and 15% on 9th post-operative day. Timing of test was influenced by patient's disability and dependency level. 32.50% of subjects had no comorbidities, 32.50 % had Diabetes mellitus with hypertension, 22.50% had only hypertension and 12.50% had only diabetes mellitus. The Rate of perceived exertion on Borg scale at rest had a mean of 6.575$\pm$0.6751.

In this study 75% poor Sleep quality and 25% had good Sleep Quality, mean for global score was 10.13 $\pm$4.719. In component score, mean of Sleep disturbances was 1.825 $\pm$ 0.7472, mean of Sleep latency was 1.800 $\pm$ 0.9392, mean of Sleep duration 1.775 $\pm$ 0.9997, mean of Subjective sleep quality 1.625 $\pm$ 1.055, mean of Habitual sleep efficiency 1.625 $\pm$1.030, mean of Day time dysfunction was the lowest scoring component of PSQI with a mean 1.575$\pm$ 1.010.

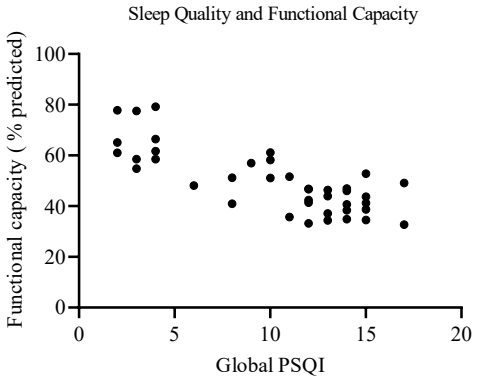
Mean distance walked during 6 minutes was 258.9 $\pm$62.14 meters, the predicted distance was 522.1$\pm$ 19.64 meters. The mean Functional Capacity (percent predicted) was 49.69$\pm$ 12.41%.

r value is -0.7301 between Global Score of PSQI (Sleep Quality) and Percent Predicted Value of 6MWT (Functional Capacity) which shows Strong Negative Correlation and is statistically significant with a p value of 0.0001 as seen in graph 1.

As seen in graph 2, there is strong negative correlation between the Components of PSQI and functional capacity. Highest being Sleep Disturbances and functional capacity with r value -0.6738 with statistically significance of

a p value 0.0001, followed by Subjective Sleep Quality and Functional Capacity with r value -0.6520 with statistically significance of a p value of <0.0001. This was followed by Sleep Duration and Functional Capacity with r value -0.6309 with statistically significance of a p value 0.0001. Sleep Latency and Functional Capacity had r value -0.6004 with statistically significance of a p value 0.0001. The r value for Daytime Dysfunction and Functional Capacity is -0.5599 which shows strong negative correlation and is statistically significant with a p value of 0.0002. Lowest was Habitual Sleep Efficiency and Functional Capacity with r value -0.5211 with statistically significance of a p value 0.0006.

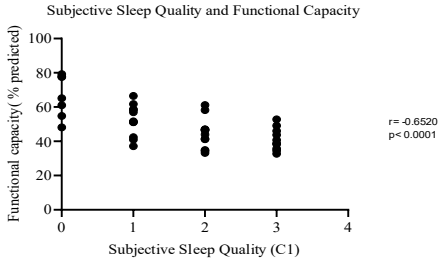
a.Correlation between Sleep quality and Functional Capacit



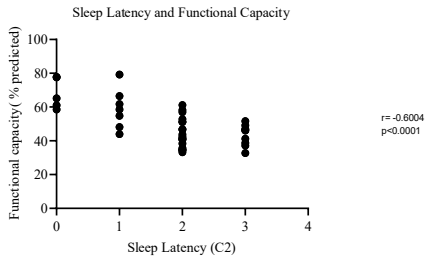
Graph 1: Correlation between Sleep Quality and Functional Capacity

Inference: In Graph 1 statistically significant Strong negative correlation (r =-0.7301, p<0.0001, N= 40) between Global Score of PSQI (Sleep Quality) and Functional Capacity using Spearman rho correlation.

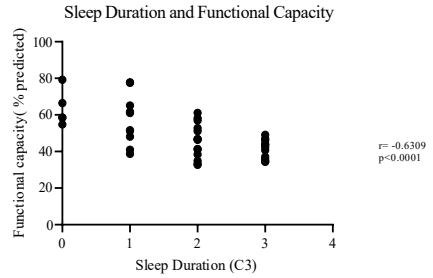
b. Correlation between Components of PSQI and Functional Capacity.



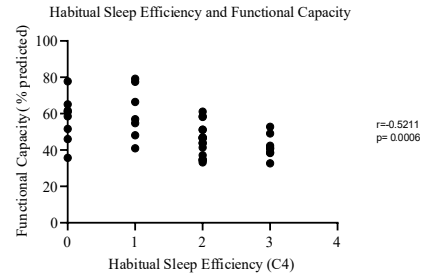
2 i Correlation between Subjective Sleep Quality and Functional Capacity



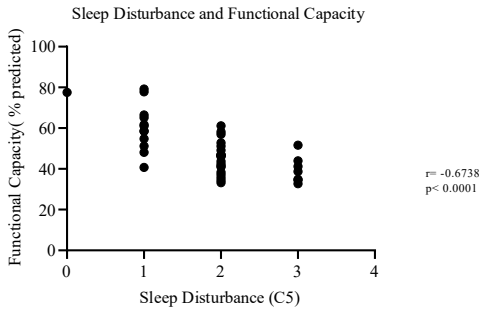
2ii. Correlation between Sleep Latency and Functional Capacity



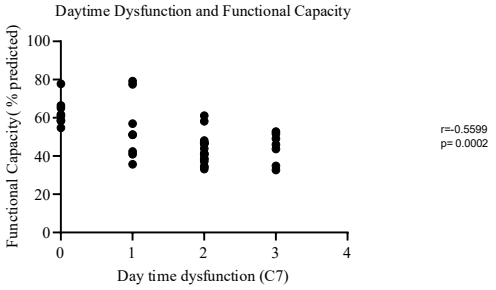
2 iii Correlation between Sleep Duration and Functional Capacity



2iv Correlation between Habitual Sleep Efficiency and Functional Capacity



2v. Correlation between Sleep Disturbance and Functional Capacity



2vi. Correlation between Daytime Dysfunction and Functional Capacity

Graph 2: Shows Spearman rho Correlation between Individual Components of PSQI and Functional Capacity

Inference: In Graph 2 shows Negative Correlation between Individual Components of PSQI (Sleep quality) and Functional Capacity using Spearman rho correlation.

DISCUSSION

To the best of our knowledge this is the first study to focus specifically on the correlation between sleep quality and functional capacity in hospitalized CABG patients in India. The primary findings of our study showed strong negative correlation between Global Score of Pittsburgh Sleep Quality Index (Sleep Quality) and Percent predicted value of 6 Minute Walk Test (Functional Capacity). Higher the Score on Pittsburgh Sleep Quality Index (PSQI) lower was the Functional Capacity (Percent predicted value of 6MWT).

Sleep Quality: Sleep is an important process for proper restoration and recovery. Sleep issues ranked 2nd in primary health problems one-week post hospitalization [4].

In our study, 75% of the participants had poor sleep quality and 25% had good sleep quality. The mean global PSQI score of our participants was 10.13 ±4.719. Participants reported an average sleep duration of 4.913± 2.109 hours with a sleep efficiency (total sleep duration/ Time in bed) of 66. 07%. This is similar to the pooled values reported by a systemic study done by Liao WC (2011) showing sleep duration of 5 hours and sleep efficiency of 62.6% in similar time point with a global PSQI score of 6.1 indicating poor sleep quality. [18] The global score in our study was slightly higher indicating poorer sleep quality. However, global score in our study was slightly lower than a study done by Pei-Lin Yang in 2015 having a global score of 12.39 ± 5.26 [4]. Similarly, in a study done by Yilmaz et al. in 2007 sleep duration was of 6 hours and sleep efficiency of 67.2% in similar time point with a global PSQI score of 6.1± 0.8 [19]. The score of all four studies is indicative of poor sleep quality post CABG.

The most frequent cause of Sleep disturbances was incisional pain, awakening in the night to go the toilet, unable to fall asleep again and coughing. Many of our patients were prescribed diuretics, hence going to the toilet was one of the primary reasons for sleep disturbances. Other factors causing sleep disturbances were loud noises in the ward, bright lights in the ward, ongoing medical procedures on other patients and stress and anxiety due to future adaptive changes. The study done by Pei-Lin Yang (2015) and Liao WC (2011) had similar causes for nocturnal sleep disturbances [4,18]. Physiotherapy interventions like TENS, breathing exercises, huffing technique, manual splinting can help to reduce pain and coughing bouts. Patient education should include timings for taking diuretics to prevent nocturia and avoid sleep disturbances.

Functional Capacity: Functional Capacity also called as exercise capacity refers specifically to the ability to perform particular activities. The 6 Minute Walk Test (6MWT) is one of the most popular clinical exercise test used to evaluate Functional Capacity. 6MWT has shown accurate estimation of the maximal oxygen uptake [20].

6MWT was well tolerated by all the participants and no cardiopulmonary complications were reported. Mean distance walked during 6 minutes the predicted distance and Functional Capacity values in our study are slightly lower than Fiorina et al.'s (2007) study, where mean distance walked 304 ± 89 meters having percent predicted 58 ± 15% [12]. Whereas a study done by Yueh-Chi Chen in 2018 shows mean distance walked 277.3± 85.7 meters having percent predicted 36.6±10.5% which are slightly lower than our values [21]. The possible reason for this variation could be the difference in race, culture, ethnicity, physical activity and different reference equation [16].

Sleep Quality and Functional Capacity: In our study, we found strong negative correlation between Global Score of Pittsburgh Sleep Quality Index (Sleep Quality) and Percent predicted value of 6MWT (Functional Capacity).

Sleep is important for proper wound healing. Poor sleep can lead to impaired wound healing, fatigue delaying recovery and prolonging time of bed rest. Prolonged the bed rest may in turn make it more difficult for the patient to fall asleep, which causes poor sleep efficiency and the vicious cycle continues [4,22]. As time in bed increases, level of immobility also increases, affecting Functional Capacity.

This implies that, as sleep quality deteriorates

functional capacity also reduces. Although functional capacity alone is an independent predictor of mortality and morbidity [10], presence of poor sleep quality could double the burden or worsen the cardiovascular health outcomes during rehabilitation. Functional Capacity and Sleep Quality are independently associated with Quality of Life (QoL). Post-operative fatigue, pain, poor sleep quality and functional capacity may deteriorate both physical and psychological function during recovery hampering the Quality of Life [23-25].

Hence, Reduction in bed rest, proper patient education, relaxation, cardiac rehabilitation after surgery is necessary for early improvement in sleep quality. A Meta-analysis conducted by Yang et al. in 2012, showed how regular exercise impacts sleep quality in middle-aged and older adults with sleep complaints, results showed moderate positive effect [26]. Similarly, in a study done by Hady Atef, aerobic and resistance training showed improvement on sleep, functional capacity in middle aged patients after Coronary Artery Bypass Grafting [27].

Assessment, evaluation and treatment to improve sleep quality should be considered as one of the important components of cardiac rehabilitation to improve the functional capacity of these patients. Pre-operative and post-operative cardiac rehabilitation program should be well tailored to improve sleep quality which will in turn improve functional capacity.

CONCLUSION

The results of this study showed strong correlation between Sleep Quality and Functional Capacity. We were able to determine the factors most affecting sleep quality and in turn functional capacity. Reduction in bed rest, proper patient education, pain management relaxation as a part of cardiac rehabilitation after surgery is necessary for early improvement in sleep quality and functional capacity.

Limitations & recommendation: A longitudinal cohort design would work better for this type of study wherein same subjects can be assessed over the period of time from pre- operative to post-operative recovery period. However, due to time constraint, we had designed it as a cross - sectional observational study. The sample was collected from a single institution and the sample size was small hence, the results cannot be generalized. Multicentric study can be done to generalise the results. As PSQI is a self-report measure, subjective bias may be possible. Hence, use of objective tools to measure sleep quality can be used.

ACKNOWLEDGEMENTS

The authors acknowledge Dr. Ramesh Bharmal (Dean), Dr. Kanak Nagle (HOD, Department of Cardiovascular and Thoracic Surgery), Dr. Chhaya Verma (HOD, Physiotherapy School & Centre), for allowing us to carry out this study. All Postgraduate Students, faculty and Staff Members of Physiotherapy School & Centre, T.N.M.C & B.Y.L Ch Nair Hospital for their support and suggestions. We would like to specially acknowledge the patients for their valuable time and co-operation.

ABBREVIATION

CABG: Coronary Artery Bypass Grafting
SQ: Sleep Quality
FC: Functional Capacity
PSQI: Pittsburgh Sleep Quality Index
6MWT: Six Minute Walk Test
RPE: Rate of Perceived Exertion
SPO_2: Peripheral Capillary Oxygen Saturation
CVTS: Cardio-Vascular and Thoracic Surgery

Conflicts of interest: **None**

REFERENCES

[1]. Sleep | Definition of Sleep by Oxford Dictionary on Lexico.com also meaning of Sleep [Internet]. Lexico Dictionaries | English. 2020 https://www.lexico.com/definition/sleep [Last Accessed on 25 August 2020].

[2]. Ranjbaran S, Dehdari T, Sadeghniiat-Haghighi K, Majdabadi MM. Poor sleep quality in patients after coronary artery bypass graft surgery: An intervention study using the PRECEDE-PROCEED model. The Journal of Tehran University Heart Center. 2015;10(1):1. https://pubmed.ncbi.nlm.nih.gov/26157457/

[3]. Phillips B, Gelula R. Sleep-wake cycle: Its physiology and impact on health. National Sleep Foundation. 2006:1-9. [doi: 10.2337/diaspect.29.1.5]

[4]. Yang PL, Huang GS, Tsai CS, Lou MF. Sleep quality and emotional correlates in Taiwanese coronary artery bypass graft patients 1 week and 1 month after hospital discharge: a repeated descriptive correlational study. PLoS One. 2015 Aug 20;10(8):e0136431. [https://doi.org/10.1371/journal.pone.0136431]

[5]. Dolan R, Huh J, Tiwari N, Sproat T, Camilleri-Brennan J. A prospective analysis of sleep deprivation and disturbance in surgical patients. Annals of medicine and surgery. 2016 Mar 1;6:1-5. [doi: 10.1016/j.amsu.2015.12.046]

[6]. Redeker NS, Ruggiero JS, Hedges C. Sleep is related to physical function and emotional well-being after cardiac surgery. Nursing Research. 2004 May 1;53(3):154-62. [doi: 10.1097/00006199-200405000-00002]

[7]. Coronary artery bypass surgery [Internet]. En.wikipedia.org. 2020 https://en.wikipedia.org/wiki/Coronary_artery_bypass_surgery [Last Accessed 25 August 2020].

[8]. Christensen M. Noise levels in a general surgical ward: a descriptive study. Journal of clinical nursing. 2005 Feb;14(2):156-64. [doi: 10.1111/j.1365-2702.2004.01040.x]

[9]. Cooper KH. A means of assessing maximal oxygen intake: correlation between field and treadmill testing. Jama. 1968 Jan 15;203(3):201-4. [doi:10.1001/jama.1968.03140030033008]

[10]. Arena R, Myers J, Williams MA, Gulati M, Kligfield P, Balady GJ, Collins E, Fletcher G. Assessment of functional capacity in clinical and research settings: a scientific statement from the American Heart Association Committee on Exercise, Rehabilitation, and Prevention of the Council on Clinical Cardiology and the Council on Cardiovascular Nursing. Circulation. 2007 Jul 17;116(3):329-43. [doi: 10.1161/CIRCULATIONAHA.106.184461.]

[11]. Fleg JL, Pina IL, Balady GJ, Chaitman BR, Fletcher B, Lavie C, Limacher MC, Stein RA, Williams M, Bazzarre T. Assessment of functional capacity in clinical and research applications: An advisory from the Committee on Exercise, Rehabilitation, and Prevention, Council on Clinical Cardiology, American Heart Association. Circulation. 2000 Sep 26;102(13):1591-7. [doi: 10.1161/01.cir.102.13.1591]

[12]. da Costa Torres D, dos Santos PM, Reis HJ, Paisani DM, Chiavegato LD. Effectiveness of an early mobilization program on functional capacity after coronary artery bypass surgery: A randomized controlled trial protocol. SAGE Open Medicine. 2016 Dec 14;4:2050312116682256. [doi: 10.1177/2050312116682256.]

[13]. Fiorina C, Vizzardi E, Lorusso R, Maggio M, De Cicco G, Nodari S, Faggiano P, Dei Cas L. The 6-min walking test early after cardiac surgery. Reference values and the effects of rehabilitation programme. European Journal of Cardio-thoracic Surgery. 2007 Nov 1;32(5):724-9. [doi: 10.1016/j.ejcts.2007.08.013]

[14]. Kadikar A, Maurer J, Kesten S. The six-minute walk test: a guide to assessment for lung transplantation. The Journal of heart and lung transplantation: the official publication of the International Society for Heart Transplantation. 1997 Mar 1;16(3):313-9. https://pubmed.ncbi.nlm.nih.gov/9087875/

[15]. Buysse DJ, Reynolds III CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry research. 1989 May 1;28(2):193-213. [doi: 10.1016/0165-1781(89)90047-4]

[16]. Palaniappan Ramanathan R, Chandrasekaran B. Reference equations for 6-min walk test in healthy Indian subjects (25-80 years). Lung India. 2014;31(1):35-38. doi:10.4103/0970-2113.125892 [doi: 10.4103/0970-2113.125892]

[17]. ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories. ATS statement: guidelines for the six-minute walk test. Am J Respir Crit Care Med. 2002;166:111-7. [doi: 10.1164/ajrccm.166.1.at1102]

[18]. Liao WC, Huang CY, Huang TY, Hwang SL. A systematic review of sleep patterns and factors that disturb sleep after heart surgery. J Nurs Res. 2011;19(4):275-288. [doi:10.1097/JNR. 0b0 13e318236cf68]

[19]. Yilmaz H, Iskesen I. Follow-up with objective and subjective tests of the sleep characteristics of patients after cardiac surgery. Circulation Journal. 2007;71(10):1506-10. [doi: 10.1253/circj.71.1506]

[20]. Ross RM, Murthy JN, Wollak ID, Jackson AS. The six minute walk test accurately estimates mean peak oxygen uptake. BMC Pulm Med 2010;10:31. [doi: 10.1186/1471-2466-10-31]

[21]. Chen YC, Chen KC, Lu LH, Wu YL, Lai TJ, Wang CH. Validating the 6-minute walk test as an indicator of recovery in patients undergoing cardiac surgery: A prospective cohort study. Medicine (Baltimore). 2018;97(42):e12925. [doi:10.1097/MD.0000000000012925]

[22]. Cespuglio R, Colas D, Gautier-Sauvigné S. Energy processes underlying the sleep–wake cycle. InThe Physiologic Nature of Sleep 2005 (pp. 3-21). [https://doi.org/10.1142/9781860947186_0001]

[23]. Järvinen O, Saarinen T, Julkunen J, et al. Changes in health-related quality of life and functional capacity following coronary artery bypass graft surgery. Eur J Cardiothorac Surg 2003;24:750–6. [doi: 10.1016/s1010-7940(03)00413-5.]

[24]. Edéll-Gustafsson U. Sleep, psychological symptoms and quality of life in patients undergoing Coronary Artery Bypass Grafting. Nordic Journal of Psychiatry. 1999 Jan 1;53(2):159-62. [https://doi.org/10.1080/080394899426882]

[25]. Lindsay GM, Hanlon P, Smith LN, Wheatley DJ. Assessment of changes in general health status using the short-form 36 questionnaire 1 year following Coronary Artery Bypass Grafting. European journal of cardio-thoracic surgery. 2000 Nov 1;18(5):557-64. [doi: 10.1016/s1010-7940(00)00542-x]

[26]. Yang PY, Ho KH, Chen HC, Chien MY. Exercise training improves sleep quality in middle-aged and older adults with sleep problems: a systematic review. Journal of physiotherapy. 2012 Sep 1;58(3):157-63. [doi: 10.1016/S1836-9553(12)70106-6]

[26]. Atef H, Helmy Z, Farghaly A. Effect of different types of exercise on sleep deprivation and functional capacity in middle aged patients after Coronary Artery Bypass Grafting. Sleep Science. 2020 Apr;13(2):113. [doi: 10.5935/1984-0063.20190136

How to cite this article: Hetal M Mistry, Gayatri S Jere. Correlation between Sleep Quality & Functional Capacity in Hospitalized Coronary Artery Bypass Grafting Patients. Int J Physiother Res 2021;9(4):3960-3967. **DOI:** 10.16965/ijpr.2021.158