Relationship between Uncertainty and Health Outcomes among Patients undergoing Coronary Artery Bypass Graft Surgery

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ABSTRACT

Background: The purpose of this study was to assess the level of uncertainty, to evaluate postoperative selected health outcomes, and to determine the relationship between the level of uncertainty and postoperative selected health outcomes among patients undergoing CABG Surgery.

Methodology: A descriptive correlational study of 208 cardiac patients was carried out through a convenient sampling technique. Four adapted questionnaires were used. The correlation coefficient was applied.

Results: The findings of the current study revealed a moderate level of uncertainty in illness among patients undergoing CABG surgery. Moreover, a statistically significant correlation is observed between the level of uncertainty and postoperative health outcomes namely mental health and readiness to discharge.

Conclusion: The current study may be significant to healthcare professionals to establish standards of practice for patients undergoing cardiac surgery to lessen the negative impact of uncertainty on postoperative health outcomes.

Keywords: Uncertainty in illness, Elective CABG, Health outcome.

INTRODUCTION

This chapter defines the background of the current study, its objectives, the research problem, the research hypothesis, the significance of the study, and key term definitions.

1.1.Background of the Study:

Cardiovascular diseases (CVDs) are a term used to describe all diseases of the circulatory system, including coronary artery disease (CAD), acute myocardial infarction (AMI), valvular heart disease, peripheral heart disease, arrhythmias, etc. The number of deaths caused by CVD is higher than any other disease, representing 32% of total deaths from all causes (WHO, 2021). It affects approximately 17 million of the world's population, whereas 40% of these patients suffer from CAD (Pooria, Pourya, & Gheini, 2020).

CVDs remain a major cause of illness, disability, and death around the globe and, not surprisingly, are associated with high economic costs to society. As of 2016, 28.1 million adults in the US were diagnosed with CAD (Garrett, 2019). For the last few years, the incidence of cardiovascular diseases has strikingly increased in Pakistan, and the hidden portion of the iceberg is growing day by day (Zia et al., 2020). The most recent WHO

statistics revealed that the proportional mortality of cardiovascular diseases in Pakistan is 29% (WHO, 2022).

Among heart diseases, coronary artery disease (CAD) is the leading cause of mortality in human societies, and coronary artery bypass graft (CABG) surgery is the most common therapeutic intervention. The primary aim of this surgery is to relieve symptoms and improve the quality of survival, it is disability-free survival that is the outcome measure. According to the Society of Thoracic Surgeons (STS) Adult Cardiac Surgery Database, 156 931 isolated coronary artery bypass graft (CABG) surgeries were performed in 2016 in the United States of America, the equivalent of about 429 procedures per day (Benuzillo et al., 2018).

The diagnosis of CAD and planning of CABG involves several psychological issues related to surgery. Each patient has individual psychological concerns, emotional reactions, and thoughts about surgery. Patients may interpret heart surgery as a scary and stressful event. A high level of anxiety was observed among patients undergoing CABG surgery (Kathania, Singh, Kaur, & Kumar, 2021). In a comparative analysis of anxiety and alexithymia of patients with CHD, the emotional state of 118 patients undergoing CABG has been examined. The results revealed that patients undergoing CABG experience a high level of anxiety and uncertainty (Eremina, 2021).

Illness uncertainty states the inability to determine the disease-related events (such as disease course, hospitalization, treatment, prognosis, etc.), and the failure to precisely envisage the consequence of related events. It does not only increase healthcare costs and reduces patient compliance, but also increases postoperative impediments, and increases healthcare costs. Usually, Healthcare staff pay more attention to the surgery, and the psychological needs of patients are neglected. Owing to a lack of disease-related information,

apprehension of symptoms reappearance, and ambiguities about the consequences of surgery, the inability of the patients to form an accurate cognitive frame for the disease, leads to a sense of uncertainty. Another point to consider is that uncertainty also stimulates the sympathetic nervous system, causing positive inotropic reactions such as accelerated heart rate and high blood pressure, further increasing the burden on the heart, and making it more disposed to adversarial life events. Resultantly, it has a series of negative effects on patients' lifestyle compliance, self-management level, and quality of life (Xia, Yu, & Wu, 2022).

Uncertainty in illness is a common experience in various diseases. Patients with cardiac conditions may experience uncertainty concerning various aspects of their illness, i.e., causes, management, and prognosis. High levels of uncertainty in illness may result in negative psychological, and interactive outcomes. Fears related to the future, explicitly fear of disease progression and recurrent events, play an important role in how uncertainty in illness is experienced by patients with cardiac disorders (Clarke, Murphy, Hester, & Jackson, 2022).

The evolution of healthcare towards a more individualized and patient-centric approach has resulted in an increased emphasis on shared decision-making. Similarly, With the expectation of greater independence, there has been a constant increase in patients' concerns regarding surgical procedures. Currently, patients anticipate extensive information to make informed decisions to reduce uncertainty regarding their perioperative journey. When patients' expectations for relevant information remain unfulfilled, due to inadequate or irrelevant information, they feel more concerned and anxious (J. Y. J. Cheng et al., 2021). Therefore, Lack of information and uncertainty have been associated with postoperative complications such as atrial fibrillation, myocardial infarction, higher rates of readmissions,

increased healthcare utilization, and higher mortality rates in CABG patients (Salzmann, Salzmann-Djufri, Wilhelm, & Euteneuer, 2020).

Merle Mishel a nurse theorist theorized that the lack of knowledge of the issues related to the illness leads a person to experience a state of uncertainty, which she described in her theory on "Uncertainty in Illness", a theory that can be applied to patients and caregivers. According to the author, uncertainty in illness refers to the inability to determine the meaning of illness and illness-related events due to insufficient signals to do so. In other words, uncertainty arises in response to confusing illness-related events due to insufficient information, unpredictable or changing symptoms, ambiguous disease trajectory, insufficient social support, inadequate support from health professionals, and the cognitive abilities to understand the development of the disease (Arias-Rojas, Carreño-Moreno, & Posada-López, 2019)

Cardiac patients undergoing CABG surgery are at risk for uncertainty in 4 domains: ambiguity about the state of their illness; lack of information about the disease, its treatment, and comorbidities; complexity of the healthcare system and relationship with healthcare providers; and unpredictability of the illness course and outcome (Moreland & Santacroce, 2018). According to the existing literature, some patients have moderate-high levels of uncertainty regarding the procedure. Although preoperative psychological preparation is gaining importance for cardiac surgery patients, their psychological status still does not get as much attention as it deserves (Salzmann et al., 2020). Preoperative psychological preparation seems to have positive effects on postoperative outcomes. Since the overall evidence is still weak, further studies are warranted to understand the relationship between the level of uncertainty and health outcomes in cardiac patients undergoing CABG surgery.

Hence, it was precisely in this context that this research aimed to determine the level of uncertainty and evaluate postoperative health outcomes namely well-being, mental health, and subjective readiness to discharge, and to determine the relationship between the level of uncertainty and postoperative selected health outcomes among patients undergoing CABG Surgery based on Mishel's Uncertainty in Illness Theory (UIT).

1.2. Problem Statement:

Heart diseases have been the leading cause of death globally for the last 20 years. However, its fatality rate is increasing more than ever before. The number of deaths from heart disease increased by more than 2 million since 2000, to nearly 9 million in 2019 (WHO, 2021). CVDs predominantly ischemic heart disease (IHD) and stroke are the leading cause of global mortality and disability. It remains the leading cause of disease burden worldwide. The burden of CVDs not only continues to rise for almost all countries outside high-income countries, but alarmingly, the rate of CVDs has begun to rise in some locations where it was previously declining in high-income countries (Roth et al., 2020).

CVDs have poor survival rates and are increasing worldwide. The prevalence cases of total CVD nearly doubled from 271 million in 1990 to 523 million in 2019, and the number of CVD deaths steadily increased from 12.1 million in 1990, reaching 18.6 million in 2019. The global trends for disability-adjusted life years (DALYs) and Years of life lost (YLLs) also increased significantly, and Years lived with a disability (YLDs) also doubled from 17.7 million to 34.4 million (Roth et al., 2020).

The most common heart diseases are CAD and heart failure with lethal symptoms of exertional angina, dyspnea, and exercise intolerance. To alleviate the suffering of the patient and improve survival outcomes, a coronary artery bypass graft is the surgical procedure commonly performed (Doenst et al., 2019). Patients undergoing CABG and those recovering

from the surgery experience numerous physical and psychological challenges. A high level of anxiety and depression can cause suffering to patients undergoing CABG surgery and result in poor outcomes. Patients who are more anxious before the CABG procedure would face more postoperative pain, less relief of cardiac signs and symptoms, higher readmission rates, and possibly high death rates. The level of anxiety is depreciated by a low health perception or lower education status, both of which result in unawareness of the healthcare environment. Cardiac patients who are anxious are more likely to unfollow the postoperative care plans, resulting in poor incidents (Zaini, Abdullah, Raja Mokhtar, Chinna, & Kamaruzzaman, 2022).

Uncertainty in illness is the most common experience in many acute and chronic conditions. Patients with cardiac diseases may experience uncertainty about various aspects of their illness, i.e., its causes, management, and prognosis, as well as uncertainty about the future. There are numerous contributors to uncertainty among these patients, several are related to patient factors, such as previous expectations of the illness, sensitivity to physical symptoms, and intolerance of uncertainty. Service factors, such as insufficient information, can also add to uncertainty. High levels of uncertainty may result in negative psychological, cognitive, and behavioral outcomes. Fears related to the future, precisely fear of disease progression and recurring events, play an important role in how uncertainty is perceived by cardiac patients (Clarke et al., 2022).

Currently, an individualized psychological health assessment is neglected in healthcare settings for patients having physical problems, as a result, the recovery of patients is delayed. Similarly, there are no established standard guidelines available to evaluate cardiac surgery patients in the context of psychological well-being and level of uncertainty for health outcomes (Malitas, 2016). A few investigators have explicitly examined the unique role of uncertainty in the context of health outcomes, but extensive literature about the

level of uncertainty in the perspective of the outcome of cardiac surgery patients is lacking. So, the present study aimed to determine the level of uncertainty and evaluate postoperative health outcomes namely well-being, mental health, and subjective readiness to discharge, and to determine the relationship between the level of uncertainty and postoperative selected health outcomes among patients undergoing CABG Surgery.

1.3. Objectives of the Study:

1. To assess the level of uncertainty among patients undergoing CABG surgery.

2. To assess postoperative health outcomes namely well-being, mental health, and subjective readiness to discharge among patients undergoing CABG surgery.

3. To determine the relationship between uncertainty and health outcomes namely postoperative well-being, mental health, and subjective readiness to discharge among patients undergoing CABG surgery.

1.4. Research Questions:

This study aimed to answer the following research questions.

1. What is the level of uncertainty among patients undergoing CABG surgery?

2. What are health outcomes in terms of postoperative well-being, mental health, and readiness to discharge?

3. Is there any relationship between uncertainty and selected health outcomes among patients undergoing CABG surgery?

1.5. Significance of the Study:

This study is expected to enrich the literature related to the burden of cardiac diseases. Knowing more about the extent of such correlations may provide useful suggestions on how to better assist cardiac patients and how to support them along their long-term care path.

The results of this study are also expected to serve as a reference for nurses to pay increased attention to any psychological and physical changes, especially among patients who are more susceptible to anxiety and depression. Nurses should also try to meet specific nursing needs in preventing more serious complications such as mental ailments.

As the mental satisfaction of the patient is the responsibility of doctors and nurses, the unique contribution of this study will emphasize the need for interventions to address the needs of the patient's level of uncertainty and thus will improve the post-operative health outcomes and satisfaction level of the patients.

Patient uncertainty can be relieved more reliably by using reframing and empowering interventions than by presenting the information. Therefore, preoperative interventions by nurses could include tasks directed towards reducing uncertainty, such as providing information and interpreting events. The results of this study will provide the basis for nurses' practice and basic information about uncertainty in illness. Furthermore, it may be incorporated as a part of the Nursing curriculum. Similarly, the results of this study will provide a Policymaking base ground for future implications.

Conceptual Framework:

The framework for this study is based on Mishel's UIT to investigate the level of uncertainty and its relationship with health outcomes among patients undergoing elective CABG surgery. Mishel's uncertainty in illness theory (UIT), proposed in 1988, is a theoretical framework for describing how an individual copes with a disease when unable to predict the outcome of an illness. Mishel's UIT consists of three principal themes: antecedents of uncertainty, appraisal of uncertainty, and coping with uncertainty.

Antecedents of uncertainty refer to experiences that have occurred before the onset of an illness and affect a person's thinking, such as perception of disease, exposure to pain, and prior experiences. This theme has three components: stimuli frame, cognitive capacity, and structure providers.

Appraisal of uncertainty refers to how a person assesses an illness situation, which can be viewed as a danger or an opportunity. The danger is the possibility of a negative outcome, while the opportunity is the likelihood of a positive outcome.

Coping with uncertainty refers to the strategies an individual employs to manage the uncertainties of disease. Coping with a danger appraisal is viewed as a responsive action to decrease the level of uncertainty, which deals with the emotion produced by a danger appraisal. Coping with a situation that is evaluated as an opportunity, involves direct actions that will provide positive feelings and hope.

Uncertainty always exists in the disease trajectory. When the role of the individual is changed, the daily functions are limited, social communication is terminated, and the life of the individual is in danger because of the disease, uncertainty shows up naturally. Under these circumstances, the individual may employ problem-focused or emotion-focused strategies to adapt to difficult situations to maintain their quality of life.

In the current study, the perception of health and disease was regarded as the antecedent factor of uncertainty. Postoperative health outcomes (well-being and mental outcomes) were considered as the appraisal of uncertainty. Postoperative subjective readiness to discharge was taken as coping with uncertainty.

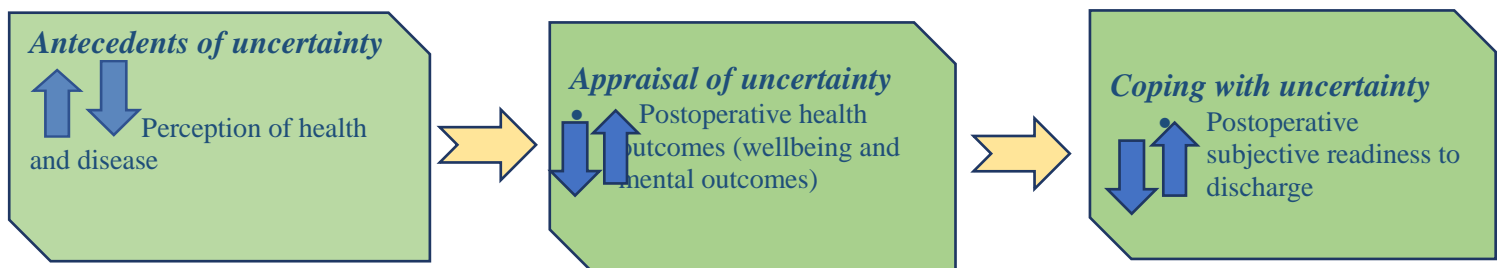**The theoretical framework for this study is shown in Fig. 2.1**

Fig 2.1. Theoretical Framework of this Study: Mishel`s theory of uncertainty in illness

Given that uncertainty is a critical sign of the CABG patients` experience, the uncertainty in the illness model (Mishel,1988) provides a fitting theoretical framework to guide the aims of this study. The concept is defined as the failure to drive the meaning of illness-related events in the absence of adequate information.

METHODOLOGY

3.1. Study Design:

In this study, there were two main variables i.e., uncertainty and health outcomes. The study was planned to find out the relationship between these two variables and therefore, a descriptive correlational research design was used to conduct this research.

3.2. Study Setting:

The study was conducted at the University of Health Sciences in collaboration with the Cardiac Surgery Department of the Punjab Institute of Cardiology (PIC), Lahore

3.3. Study Duration:

This study was carried out within 06 months after approval of the synopsis.

3.4. Study Population:

The population under this study included all the participants undergoing Elective CABG surgery procedures.

3.5. Sample Size:

The sample size was calculated by the following formula assuming the uncertainty level is equal to 73.5% with the confidence level equal to 95% and the

margin of error equal to 6%.

$$n = \frac{z_{1-\alpha/2}^2 P(1-P)}{d^2}$$

n=<u>1.96*1.96*.735(1-.735)</u>
0.06*0x.06

n = Sample size = **208**

3.6. Sampling Technique:

In this study, a convenience sampling technique was used to select the participants according to the inclusion and exclusion criteria.

3.7. Sample Selection:

3.7.1. Inclusion Criteria:

The inclusion criteria included:

- Both genders.

- Adults 18 years and above require elective CABG surgery.

- Those who have been provided with conventional pre-op information.

- Those with controlled blood glucose and blood pressure levels.

3.7.2. Exclusion Criteria:

The exclusion criteria included those:

- With a Diagnosis of any mental disorder.

- Taking anti-depressant or anti-psychotic medication

- With a history of life-threatening situations like cancer, chronic liver disease, chronic kidney disease, etc.

- Having any comorbid conditions like Tuberculosis, chronic obstructive pulmonary disease, Asthma, etc.

- Already had major surgery like Organ replacement, Joint replacement, Heart Surgeries, etc.

- Healthcare professionals

3.8. Data Collection Tools/Instruments (Annexure II)

In this study, four adapted questionnaires were used to assess the level of preoperative uncertainty, postoperative well-being, mental health, and readiness to discharge from the hospital, respectively. It was translated into the Urdu language. The researcher framed these four into a single format. It consisted of three parts:

    I.   Socio-demographic data

    II.   Preoperative Questionnaire

    III.   Postoperative Questionnaire

3.8.1. Socio-Demographic Data: consisted of Demographic Variables like Gender, Age, Marital status, and Level of education.

3.8.2. Pre-operative Questionnaire: Through this questionnaire, preoperative uncertainty was assessed through the Mishel Uncertainty in Illness Scale (MUIS) (Mishel, 1981). It was adopted and modified for CABG surgery consisting of 25 items rated on a 5-point Likert scale from "strongly disagree" to "strongly agree". The responses represent the patient's perception of uncertainty about their symptoms, diagnosis,

treatment, relationship with caregivers, and prognosis. Results were interpreted as follows:

Total scores = 25-125

91.8 - 125 = High level of uncertainty

58.4 - 91.7 = Moderate level of uncertainty

25 - 58.3 = Low level of uncertainty

3.8.3. Post-Operative Questionnaire: it consisted of three parts and measured patients' perception of mental health and well-being, and perceived readiness to discharge.

a) **Postoperative well-being** was measured with a Self-Anchoring Scale (Cantrill, 1965), a single-item global subjective well-being measure. The scale is presented as a ladder, with the bottom marked 0 ('the worst possible life for you) and the top '10 ('the best possible life for you). Participants were asked to situate themselves according to their perceptions of life situations at present. The measure is global and allows patients to respond according to facets of their lives they believe are most important (Ohlendorf et al., 2021).

Results were interpreted as follows.

Best possible life (7-10) = 3

Somehow satisfactory life (4-6) = 2

Worst possible life (0-3) = 1

b) **Postoperative mental health** was examined by 6 items taken from the Medical Outcome Study Short-Form Survey (MOS SF-36) (Ware & Sherbourne 1992). This subscale is well-validated (McHorney et al., 1994; Ware 2000). Respondents scored their answers on a scale of 1 (not at all) to 5 (all the time). The responses

represent the patient's perception of their mental health after CABG surgery. Results were interpreted as follows:

Total scores = 6-30

23-30 = Very good mental health

15-22= Good mental health

6-14　　= Poor mental health

c) **Subjective readiness to discharge** was measured with a 5-point, adapted questionnaire consisting of five statements expressing a range of possible subjective assessments of discharge from the hospital. Respondents scored their answers on a scale of 1 (not at all) to 5 (To a very large extent) (Kagan & Bar‐Tal, 2008).

3.9. Data Collection Procedure:

After the approval by the synopsis review committee, the Ethical Review Committee (ERC), and the Advanced Studies Research Board (ASRB) of the University of Health Sciences Lahore, the data was collected within three months from the selected hospital after Institutional permission. Informed consent was taken from those participants who were meeting inclusion criteria and were willing to participate in the study. The confidentiality and privacy of the participants was ensured. The purpose of the study was communicated to the participants. By using the convenience sampling technique, the participants were selected and asked to fill up all the sections of the study questionnaire. The ethical principles of Helsinki were used as guidelines to conduct this study. Participants were allowed to receive the main results of the study.

3.10. Validity & Reliability of the Questionnaire/Tool

The validity of the questionnaire has been established through an agreement among a panel of experts including cardiac surgeons, nurse specialists, English lecturers, biostatisticians, and well-known researchers. Additionally, CVI was also calculated. It was 0.92 showing the tool is valid for use in this study.

Moreover, pilot testing was done to ensure the reliability of the tool in the Pakistani context to eliminate cultural and language bias. A sample of ten percent (10%) of the population, twenty-one (21) cardiac patients undergoing elective CABG surgery were approached and requested to fill out the questionnaire. Once the questionnaires were filled, a statistical test Cronbach`s Alpha was applied to check the reliability of the questionnaire. the calculated internal consistency was 0.87 showing the tool is reliable for the present study.

3.11. Data Analysis

Data were analysed by SPSS software version IBM-26 for proper analysis. Descriptive statistics, i.e., simple percentage, mean, and standard deviation, were used to assess the participants' sociodemographic data, uncertainty, and health outcomes. The correlational coefficient was used to test the relationship between the uncertainty and health outcomes of the participants.

RESULTS

This chapter comprises three sections i.e., the demographic profile of participants, preoperative level of uncertainty, and post-operative health outcomes namely well-being, mental health, and readiness to discharge.

4.1. Section I. Demographic Profile:

The demographic part of the questionnaire contains information on the participant's age, gender, marital status, and education level.

Table 4. 1: Gender of the study participants

	Frequency	Percent
Male	152	73.1
Female	56	26.9
Total	208	100.0

Table 4.1 shows that most of the participants152 (73.1%) were male. The rest of the participants 56 (26.9%) were female.

Table 4. 2: Age of the study participants

	Frequency	Percent	Mean ± S. D
Age (29-38 Years)	11	5.3	3.69 ± 0.56
Age (39-48 Years)	42	20.2	
Age (49 and above)	155	74.5	
Total	208	100.0	

Table 4.2 reveals that most of the participants 155 (74.5%) were age 49 and above. The rest of the participants 42 (20.2%) were in the age group of 39-48 years and 11 (5.3%) were in the age group of 29-38 years.

Table 4. 3: Marital status of the study participants

	Frequency	Percent
Unmarried	3	1.4
Married	173	83.2
Divorced	9	4.3
Widow	23	11.1
Total	208	100.0

Table 4.3 reveals that most of the participants 173 (83.2%) were married. Of the rest of the

participants, 23 (11.1%) were widows, 9 (4.3%) were divorced and 3 (1.4%) were unmarried.

Table 4. 4: Education level of the study participants

	Frequency	**Percent**
Primary Level	117	56.3
Secondary Level	68	32.7
Bachelor Level	19	9.1
Master Level	3	1.4
Others	1	.5
Total	208	100.0

Table 4.4 illustrates that most of the participants 117 (56.3%) were primary pass while 68

(32.7%) participants had secondary education, 19 (9.1%) had bachelor's degrees, and 3

(1.4%) had master's education. However, others included 1 (.5%).

4.2. Section II. Level of Uncertainty:

In the second part of the questionnaire, the preoperative uncertainty level was assessed

through the Mishel Uncertainty in Illness Scale (MUIS).

Table 4. 5: Preoperative Uncertainty Level of the Study Participants

	Frequency	**Percent**	**Mean ± S. D**	
High level of uncertainty	29	13.9	1.86 ± 0.35	
Moderate level of uncertainty	178	85.6		
Low level of uncertainty	1	.5		
Total	208	100.0	100.0	

Table 4.5 demonstrates that most of the participants 178 (85.6%) perceived a moderate level

of uncertainty before undergoing elective CABG surgery. However, 29 (13.9%) respondents had a high level of uncertainty, and 1 (.5%) respondent had a low level of uncertainty.

4.3. Section III. Postoperative Health outcomes:

The third section illustrates findings of health outcomes namely postoperative well-being, mental health, and perceived readiness to discharge from the hospital.

4.3.1. Postoperative well-being:

Postoperative well-being was measured with a Self-Anchoring Scale (Cantrill, 1965).

Table 4. 6: Postoperative well-being as perceived by the study participants.

		Frequency	Percent
	The best possible life	67	32.2
	Somehow satisfactory life	141	67.8
	The worst possible life	0	0
	Total	208	100.0

Table 4.6 shows that most of the study participants 141 (67.8%) perceived a somehow satisfactory life on the postoperative well-being scale. Whereas 67 (32.2%) were in opinion of the best possible life.

4.3.2. Postoperative mental health:

Postoperative mental health was measured by the Medical Outcome Study Short-Form Survey (MOS SF-36) (Ware & Sherbourne 1992)**.**

Table 4. 7: Perception of the participants about postoperative mental health

	Frequency	**Percent**
Poor mental health (6-14)	163	78.4

Good mental health (15-22)	39	18.8
Very good mental health (23-30)	6	2.9
Total	208	100.0

Table 4.7 exhibits that as per the scoring criteria for the perception of mental health, most of the prticipants163 (78.4%) perceived poor mental health. However, 39 (18.8%) participants perceived a good level of mental health, and 6 (2.9%) were in the opinion of a very good level of mental health.

4.3.3. Postoperative Readiness to discharge from the hospital:

Postoperative Readiness to discharge from the hospital was measured with a scale constructed by the authors consisting of five statements expressing a range of possible subjective assessments of discharge from the hospital ranging from not at all to a very large extent (Kagan & Bar‐Tal, 2008).

Table 4. 8: Postoperative Readiness of the Participants to discharge from the hospital.

	Frequency	**Percent**
Not at all	0	0
To a small extent	14	6.7
To a moderate extent	137	65.9
To a Large Extent	55	26.4
To a very Large Extent	2	1.0
Total	208	100.0

Table 4.8 elucidates that 137 (65.9%) of the participants were ready to be discharged from the hospital to a moderate extent, 55 (26.4%) to a large extent, 14 (6.7%) to a small extent, 2 (1.0%) with a very large extent.

Correlations:

Table 4. 9: Mean standard deviation of uncertainty and postoperative mental health:

| Descriptive Statistics			
	Mean	Std. Deviation	N
Uncertainty Level	82.0721	8.19565	208
Mental Health	16.8221	2.87116	208

Table 4.9 reveals that the calculated mean was 82.0721 and 16.8221 for uncertainty level and post-operative mental health correspondingly. Whereas the calculated standard deviation was 8.19565 and 2.87116 for uncertainty level and post-operative mental health respectively.

Table 4. 10: Correlation between level of uncertainty and postoperative mental health:

Correlations			
		Uncertainty Level	Mental Health
Uncertainty Level	Pearson Correlation	1	-.339[**]
	Sig. (2-tailed)		.000
	N	208	208
Mental Health	Pearson Correlation	-.339[**]	1
	Sig. (2-tailed)	.000	
	N	208	208

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 4. 1: Correlation between level of uncertainty and postoperative mental health:
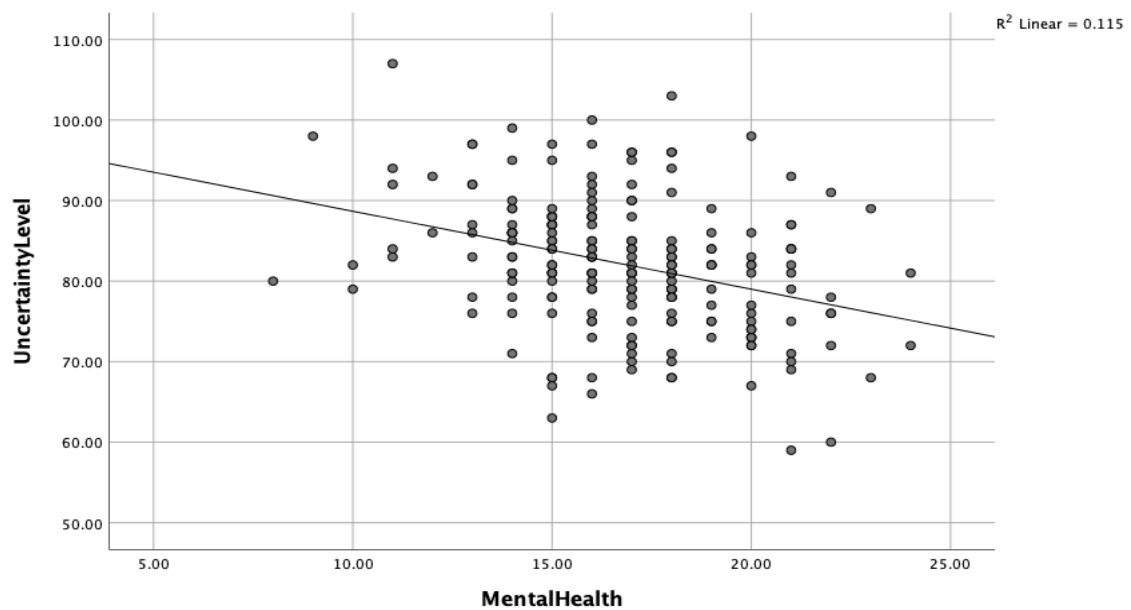
Correlation coefficient = -.339   P-value = 1

Table 4.10 and Figure 4.1 shows that there is a significant negative correlation between uncertainty and post-operative Mental health. A linear negative trend can be seen between two parameters in the above-scattered plot i.e., r = -.339, P-value = 1

Table 4. 11: Mean standard deviation of uncertainty and postoperative readiness to discharge.

Descriptive Statistics			
	Mean	Std. Deviation	N
Uncertainty Level	82.0721	8.19565	208
Readiness To Discharge	14.2029	2.47853	207

Table 4.11 reveals that the calculated mean was 82.0721 and 14.2029 for uncertainty level and post-operative readiness to discharge respectively. Whereas the calculated standard
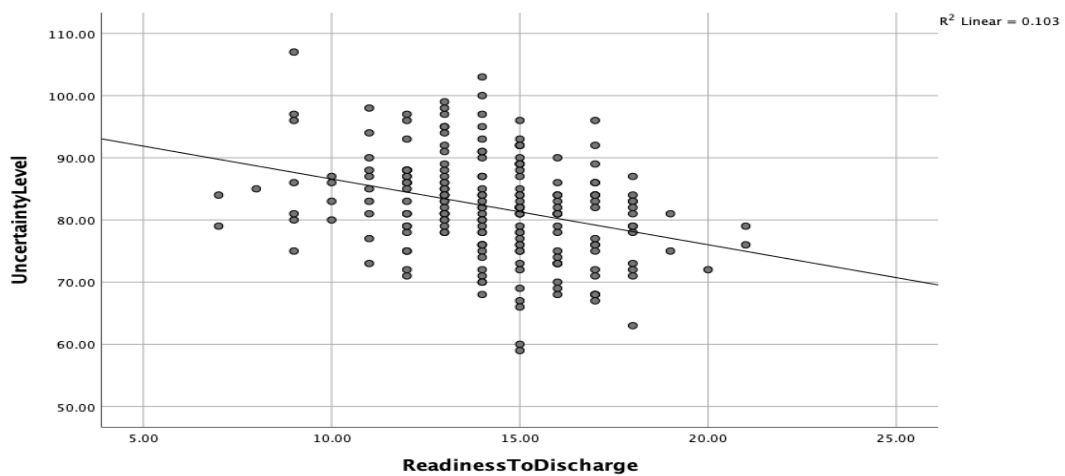
deviation was 8.19565 and 2.47853 for uncertainty level and post-operative readiness to discharge correspondingly.

Table 4. 12: Correlation between level of uncertainty and postoperative readiness to discharge:

Correlations			
		Uncertainty Level	Readiness To Discharge
Uncertainty Level	Pearson Correlation	1	-.321**
	Sig. (2-tailed)		.000
	N	208	207
Readiness To Discharge	Pearson Correlation	-.321**	1
	Sig. (2-tailed)	.000	
	N	207	207

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 4. 2: Correlation between level of uncertainty and postoperative readiness to discharge.

Correlation coefficient =   .321   P-value = 1

Table 4.12 and Figure 2 show that there is a significant negative correlation between uncertainty and post-operative readiness to discharge. A linear negative trend can be seen between two parameters in the above-scattered plot i.e., r = .321   P-value = 1

Table 4. 13: Mean standard deviation of uncertainty and Postoperative wellbeing:

|	Mean	Std. Deviation	N
Uncertainty Level	82.0721	8.19565	208
Postoperative wellbeing	6.2981	.55395	208

Table 4.13 reveals that the calculated mean was 82.0721 and 6.2981 for uncertainty level and post-operative well-being respectively. Whereas the calculated standard deviation was 8.19565 and 0.55395 for uncertainty level and post-operative general well-being respectively.

Table 4. 14: Correlation between Level of uncertainty and Postoperative well-being

		Uncertainty Level	Postoperative wellbeing
Uncertainty Level	Pearson Correlation	1	.031
	Sig. (2-tailed)		.652
	N	208	208
	Pearson Correlation	.031	1
	Sig. (2-tailed)	.652	
	N	208	208

**. Correlation is significant at the 0.01 level (2-tailed)

Figure 4. 3: Correlation between level of uncertainty and postoperative well-being:
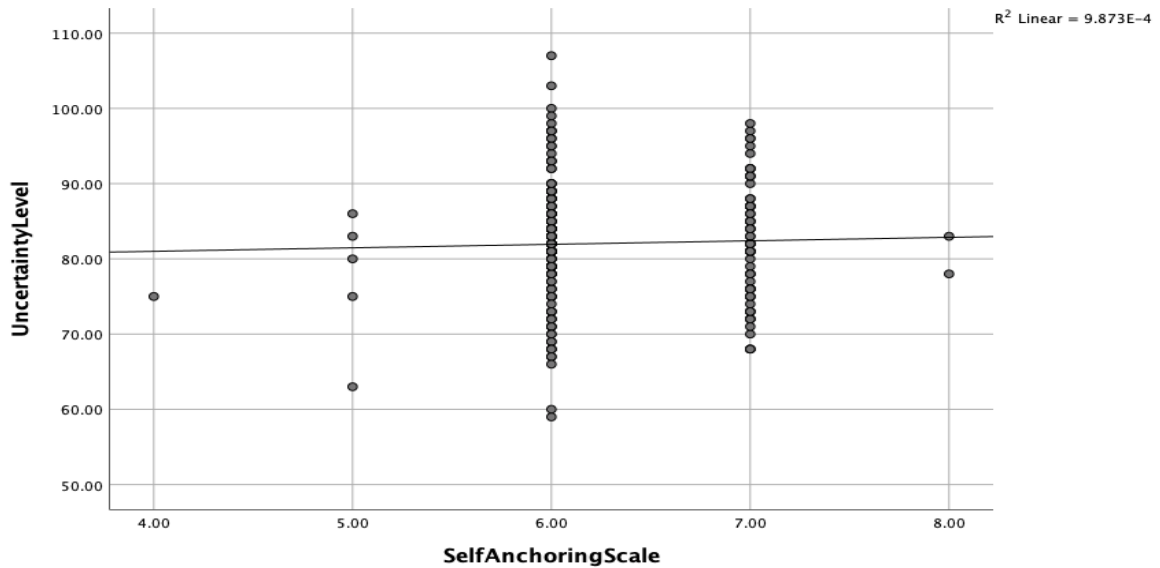
Correlation coefficient=.031   P-value= 1

Table 4.14 and Figure 4.3 show that there is no significant correlation between uncertainty and post-operative well-being. A linear positive trend can be seen between these two parameters in the above-scattered plot i.e., r = .031,   P-value = 1

DISCUSSION

The present study was carried out to investigate the relationship between uncertainty and health outcomes among patients undergoing Coronary Artery Bypass Graft surgery. This chapter consists of three sections i.e., demographics, level of uncertainty, and health outcomes.

5.1. Demographic Variables:

Under this section information regarding gender, age, marital status, and level of education are discussed.

Among 208 selected participants, the majority 152 (73.1%) were male, and the remaining 56 (26.9 %) were female. Congruent with our findings, 5450 cardiac patients undergoing CABG were analyzed out of which 4370 (80.2%) were men (Dharmalingam, Amirtharaj, Ramachandran, & Korula, 2021). Similarly, in another study out of 210 patients, 152 (74.2%) were male and 58 (27.6%) were female (Goli et al., 2021). Comparable findings were also found in semi-structured qualitative interviews where the majority 91.6% of the participants were males (Makino, Nakata, & Yoshida, 2023). Likewise, out of 180 participants undergoing elective cardiac surgery 147 (81.6 %) were males and the remaining 33 (18%) were women (Akowuah et al., 2023).

The mean age of 208 participants was 54.8±8.71 years. (55 years). The age of the cardiac patients in the current study is consistent with the findings of a previous mixed-method study that assessed the levels and predictors of self-care of 402 hypertensive individuals in Pakistan also reported the median age of the study's participants was 55 years (Ajani, Gowani, Gul, & Petrucka, 2021). Comparable findings were reported in a cross-sectional study conducted in China documenting cardiac patients undergoing surgery in Shanghai showed the mean score for the age of the participants was 66.7±10.3 (Xia et al., 2022). In line with the current study findings, semi-structured qualitative interviews investigated the experiences and care needs of postoperative patients who underwent cardiac surgery in Japan, the mean age observed was 66.5 years (Makino et al., 2023).

Regarding marital status, most of the participants 173 (83.2%) were married. Comparable findings were reported in another study conducted in China on cardiac patients,

which disclosed that 124 (84.9%) participants were married and 22 (15.1%) participants were unmarried (Xia et al., 2022). The findings of our study are also parallel to a study conducted in Pakistan, revealing that among 402, most participants (79.85%) were married (Ajani et al., 2021).

Considering the education level, the findings of the current study revealed most of the study participants 117 (56.3%) had a primary level of education. Moreover, 68 (32.7%) had a secondary level of education. Comparable findings were reported in another study conducted on cardiac patients in China documented that 78 (46.4%) of the participants had completed lower than junior high school 37 (22.0%) had completed senior high school and 53 (31.5%) had completed higher than junior college (Xia et al., 2022).

5.2. Level of Uncertainty:

The findings of the present study revealed that most of the participants 178 (85.6%) experienced a moderate level of uncertainty. While 29 (13.9%) of the participants experienced a high level of uncertainty. Similar findings were revealed in a cross-sectional correlation study conducted on heart failure patients in northern Taiwan recognizing a moderate level of uncertainty in the illness among patients (Chen, Kao, Cheng, & Chang, 2018). Another study found that Illness-related uncertainty was positively correlated with higher levels of depression anxiety, and sickness (Wallace et al., 2022). Studies conducted in China also recognized that patients experience a moderate to high degree of illness-related uncertainty (J. Cheng et al., 2022). Our findings are also in line with a cross-sectional study conducted on cardiac patients in Shanghai that found a moderate level of disease-related uncertainty (Xia et al., 2022). Contrary literature on uncertainty in illness in cardiac patients is scarce however studies on patients with other diseases have revealed low and high levels of uncertainty in illness as a cross-sectional survey in Wuhan investigated the level of

uncertainty in illness and coping styles of 56 patients with COVID-19 found a low level of uncertainty in illness (Lan, Nie, & Lin, 2021). Moreover, patients with uterine fibroids had high uncertainty in illness, which was closely related to social support and quality of life (Luo, Liu, & Wang, 2020).

Evidence suggests that patients experience low to high levels of uncertainty in illness regardless of their diagnosed disease. It is a testament that any severe and chronic ailment may impact one's uncertainty in illness due to a lack of proper information about disease prognosis, treatment, and surgical procedures and consequently influence health-related outcomes. Uncertainty in illness is considered a cause of stress in numerous chronic diseases and is negatively associated with health-related quality of life (Chen et al., 2018). The findings of a study revealed that subjective symptom improvement, guidance and support from nurses during hospitalization, care, and support from family members, follow-up with nurses after discharge, and educational level were the most important factors and had a significant impact on the uncertainty levels. In patients with coronary heart disease, uncertainty was moderately negatively correlated with self-management ability, and highly negatively correlated with overall quality of life scores (Xia et al., 2022).

5.3. Relationship between Preoperative Uncertainty & Postoperative Health Outcomes:

General well-being, mental health, and readiness to discharge were considered as post-operative health outcomes in this study. The findings of our study revealed that preoperative uncertainty has a negative correlation with postoperative mental health. Out of 208, most of the prticipants163 (78.4%) perceived poor mental health as they rated them as depressed, and nervous and perceived lack of energy as not being full of life. It indicates the higher the perceived level of uncertainty the lower the mental health. The results of the current study are consistent with a cross-sectional study conducted in China in which out of 302 heart failure

patients, 138 (45.7%) participants perceived poor mental health. Uncertainty in illness had a significantly negative effect on mental health through perceived stress (An, Zhang, Wang, Chen, & Fan, 2022). Handful literature is available on **relationship between preoperative uncertainty** and mental health of patients with cardiac diseases but, some studies on patients with other chronic and life threatening diseases documented similar findings like ours as a randomized clinical trial on prostate cancer patients showed that patients' illness uncertainty directly, and negatively influences mental well-being (Guan, Santacroce, Chen, & Song, 2020). Our findings are also in agreement with the previous studies that identified an association between uncertainty and psychological distress in various cancer types (Wolyniec et al., 2022). Comparable findings are also documented in another study recognizing illness uncertainty causes anxiety in patients, swaying their mental adaptive ability, level of hope, and disease response capacity, and further influencing their quality of life (Li, He, Wang, & Wang, 2019).

No study was found providing contrary findings. It suggests that if the patients are uncertain about their disease prognosis and outcomes they may experience poor mental health like stress, depression, and anxiety. Moreover, a significant negative correlation between the level of uncertainty and readiness to discharge was also observed in the current study as a linear negative relationship between both variables can be seen. The majority 137 (65.9%) of the participants in the current study were moderately ready to discharge from the hospital. Similar to our findings, a study conducted on patients with cardiac valve replacement to describe the postoperative status of readiness for hospital discharge revealed that the readiness for the hospital discharge scale was at a moderate level (Liang et al., 2021). Contrary findings were revealed in the Denmark national cross-sectional survey on how unreadiness for hospital discharge predicts readmission among cardiac patients. The analysis

included 13114 patients. The majority (95%) responded that they felt highly ready for hospital discharge (Rotvig et al., 2021). The findings of the present study are also incongruent with a descriptive cross-sectional study conducted in Poland aimed to evaluate the association between readiness for hospital discharge after myocardial infarction, acceptance of illness, and social, demographic, and clinical factors. About half of the patients in this study had perceived low readiness to discharge as they were uncertain about their recovery (Hydzik et al., 2021).

Some factors like contextual differences among countries, information systems in hospitals, and availability of preoperative guiding counseling services may have an impact on patients' perception of readiness to discharge from low to high. The patients who were provided with appropriate information about their disease at the time of admission and during hospital stay may be highly ready for discharge from the hospital and vice versa. It is evident that patients' readiness for hospital discharge has been associated with their perceptions of discharge preparation interventions, their nurses' professional experience, and the structure of their units (Mabire, Bachnick, Ausserhofer, Simon, & Group, 2019).

However, no significant relationship between preoperative uncertainty and postoperative well-being was observed in the current study. Relatively little empirical evidence is available in heart patients showing a negative correlation between preoperative uncertainty and postoperative well-being as in 168 participants with heart stent implantation in China, illness uncertainty and self-management capability were negatively correlated, the higher the illness uncertainty, the poorer the self-management capability leading to poor general well-being (Xia et al., 2022). Moreover, a cross-sectional survey in the USA suggested that an illness uncertainty connected with emotional distress leads sense of

helplessness which influences the subjective well-being of women in this study (Reibel & Hutti, 2020).

Despite being eclipsed by the COVID-19 outbreak, acute coronary syndromes are still a major cause of morbidity and mortality worldwide and should not be overshadowed in this era, Given the limited heterogeneity of data published in recent months, the potential overlapping relationship between uncertainty in illness and health outcomes among patients undergoing CABG surgery, more reliable data are needed to estimate the real prevalence of uncertainty and its relationship with health outcomes. Although reports to date suggest that poor mental health and a moderate level of readiness to discharge may be related to more to moderate levels of uncertainty, consistent with our analysis, more data are needed to properly understand the relationship between uncertainty level and health outcomes in cardiac patients undergoing CABG surgery.

Conclusion

This study provides evidence that the majority of the cardiac patients undergoing elective CABG surgery experienced a moderate level of uncertainty with a strong negative relationship between the level of uncertainty and postoperative selected health outcomes namely mental health and readiness to discharge. However, the relationship between the level of uncertainty and one of the selected health outcomes namely post-operative well-being was not significant. Therefore, it is crucial to ascertain that nurses should pay heed to the psychological state of the patients as the level of uncertainty in this study is primarily driven by the patient`s lack of disease-related knowledge, fear of the recurrence of symptoms, and doubts about the effect of surgery, patients cannot form a correct cognitive framework for the disease, which in turn leads to a sense of uncertainty. Cardiac patients undergoing CABG

surgery require specific instructions from their healthcare providers, which are clear, understandable, simple, and manageable for patients.

5.4. Outcome and Utilization:

It is anticipated that the findings of this study may be utilized.

- To inform practicing nurses of the importance of the psychological well-being of patients based on a holistic care model to prevent uncertainty in illness which ultimately leads to better outcomes of care.

- To set future direction in nursing education to understand the need for curriculum revision that guarantees a curriculum designed for nursing students helps to develop their competency as health educators.

- To develop knowledge of the psychological well-being of the patient in establishing a care plan.

- To offer opportunities for hospital administration to deliberate on continuing nursing education to help nurses navigate the psychological challenge of the patient.

- To provide a platform for nurses for future research.

5.5. Implications for Future Research:

This study was conducted to evaluate the level of uncertainty in cardiac patients undergoing elective CABG by using MUIS and its relationship with the selected health outcomes. Further research can be conducted on the following areas:

- To assess the impact of the application of MUIS on the uncertainty of patients' family members relating to patients' disease and recovery.

- To assess the relationship between uncertainty and physical outcomes like post-CABG physical symptoms and complications.

- To determine the influence of social support on the uncertainty level of patients with life-threatening illness

- To evaluate various predictors associated with uncertainty among CABG patients.

5.6. Recommendations:

Following are a few suggestions to lessen the level of uncertainty in patients undergoing CABG.

- Nurses need to pay close attention to the holistic care of patients using a psycho-social model of patient care.

- Nurses need to understand patients' coping mechanisms/styles to reduce the uncertainty of illness.

- Nurses must intervene in patients' queries by providing precise and comprehensive information and patient-centered care services.

- Nurses should also ensure coping through increasing family support or other social support, using the positive emotional experiences of patients.

- Hospital administration is required to develop hospital support and information systems that strive to address patients' illness-related queries and also ensure continuous nursing education activities based on a holistic care model.

5.7. Strengths of the Study:

It is the first study of its nature in the nursing sphere of practice that identified the level of uncertainty and its relationship to health outcomes among patients undergoing elective CABG surgery in a major cardiac hospital in Punjab, Pakistan.

- It was quick and less expensive to conduct the study.

- It was suitable for the topic as experimental research was not possible.

- It was helpful to understand the complex phenomenon of perception and status of CABG surgery patients and its relationship with health outcomes.

- The focus of the research was on the objectivity of collecting quantifiable measures of the variables and inferences.

- It was helpful to understand the association among different variables like the level of uncertainty in illness and health outcomes namely well-being, mental health, and readiness to discharge.

5.8. Limitations of the Study:

- The current study lacks the uncertainty assessment of the patient`s family as the clinical practice model shifts from patient-centered care to family-centered care.

- A large sample size with a smaller value of alpha could have further increased the significance of the results.

- Study results could have been affected by confounding variables like the emotional and cognitive state, education level, and social support system of the patient which were difficult to overcome.

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