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Original Research

The Effect of Intravenous Induction of Anesthesia on the Hemodynamic Changes among Patient in Central Surgical Unit of Level-II Udayana Denpasar Hospital

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Abstract

Introduction: Intravenous anesthetic induction is a medically-induced technique that can cause hemodynamic disorder. The impact that occurs if hemodynamic disorders are not immediately resolved in patients with intravenous anaesthesia induction can cause an increase or decrease in blood pressure, decreased tissue perfusion, increased heart rate and arrhythmias so that it disrupts the surgical action plan. Blood pressure, Mean Arterial Pressure (MAP), and pulse should be monitored carefully during induction. We ought to examine the effect of intravenous induction of anesthesia on the hemodynamic changes among patients in the Level-II Udayana Denpasar Hospital.

Methods: This was a descriptive cross-sectional study with a consecutive sampling technique. All patients under intravenous induction of anesthesia were considered eligible study respondents. Data were collected using an observation sheet, The number of samples in this study were 60 respondents, and the statistical test used a univariate technique by looking at the frequency distribution of the hemodynamic features of the patient's blood pressure and pulse.

Results: Findings reported that the majority of patients were documented with normal systolic blood pressure (51: 85.0%), normal MAP (56; 93.3%), and normal pulse rate (44; 73.3%) during the intravenous induction. Low diastolic blood pressure was reported among 33 respondents (55.5%).

Conclusion: The intravenous anesthetic induction altered the hemodynamic status among the respondents.

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INTRODUCTION

Intravenous anaesthesia induction is a medically induction technique that can cause hemodynamic disorder [1][2][3]. The impact that occurs if hemodynamic disorders are not immediately resolved in patients with intravenous anaesthesia induction can cause an increase or decrease in blood pressure, decreased tissue perfusion, increased heart rate and arrhythmias so that it disrupts the surgical action plan. Blood pressure, Mean Arterial Pressure (MAP), and pulse should be monitored carefully during induction[4][5][6].

Medications prescribed for anesthesia procedures are called anesthetics. They are majorly classified into three groups: general, regional, and local anesthetic agents[7][1][8]. General anesthesia often ends with overactive sympathetic and sympathoadrenal responses that may lead to hemodynamic dysfunctions. Hemodynamically stable status is an essential goal during the anesthetic induction [8][9][10].

Intravenous induction is a medically-induced loss of consciousness before anesthesia or surgical procedures[11][12]. Intravenous anesthetic induction involves the administration of hypnotic medication through the veins[13][14][15]. These substances would quickly reach the peak concentration in the blood plasm in 30 to 60 seconds[16][17]. Fast changes in the plasm concentration would result in physiological parameter fluctuations, such as systolic, diastolic, and mean arterial pressure. It is also frequently followed by pulse rate changes [18][19].

A pilot study was conducted in the Level-II Udayana Denpasar Hospital to know the average number of patients with anesthesia procedures in the central surgical unit from February to May 2021. This study discovered that 15 surgical patients aged 17 to 56 were in ASA I and II group. During the induction, six, five, and four patients were documented with low blood pressure, high pulse rate, and generally stable hemodynamic status, respectively. Therefore, we want to examine the effect of intravenous induction of anesthesia on the hemodynamic changes among patients in Level-II Udayana Denpasar Hospital. The primary issue discussed the need for hemodynamic status monitoring in an anesthesia procedure. Hemodynamic change is a critical point that would potentially alter a patient's condition. Thereby, monitoring is a mandatory complement to this procedure. This issue was then explicitly formulated as "How is the effect of intravenous induction of anesthesia on the hemodynamic changes among patients in Level-II Udayana Denpasar Hospital?". Subsequently, this study aimed to know the effect of intravenous anesthetic induction on the hemodynamic changes among patients in Level-II Udayana Denpasar Hospital.

This study envisions the development of the theoretical basis of the nurse anesthesiology science, especially on the anesthesia complication in the cardiovascular system. The findings also may highlight the importance of intensive hemodynamic status monitoring to ensure patient safety during intravenous induction among nurse anesthesiologists. This study expects the expansion and publicity of scientific evidence

regarding hemodynamic status monitoring during intravenous anesthesia induction in future studies. The aim of this research is to describe the induction of intravenous anesthesia on the hemodynamic changes among patients in the Level-II Udayana Denpasar Hospital.

METHODS

This research is a quantitative study with an observational-analytic design with a cross-sectional approach to describe the induction of intravenous anesthesia for hemodynamic changes in patients at Level II Hospital Udayana Denpasar.

The population in this study amounted to 763 respondents in 1 year. determination of the sample using the Slovin's formula with a sample size of 60 respondents with inclusion criteria 1) All patients undergoing surgery using general anesthesia 2) Patients with light and moderate sedation anesthesia techniques 3) Patients aged 12 years to over 65 years 4) Patients with surgery elective or emergency 5) ASA I-V physical status 6) Willing to be a respondent. Exclusion criteria in this study were cancellation when the patient was already on the operating table because of an increase in blood sugar levels.

Data collection was carried out in the following way: after obtaining research permission from the director of Udayana Tk II Hospital and obtaining ethical approval from ITEKES Bali with number: 04.00335/KEPITEKES-BALI/III/2021, the researcher provided an explanation and provided an informed consent form to be a research respondent. After that the researchers made observations with observation sheets of blood pressure (systolic and diastolic), MAP and patient pulse before intravenous anesthesia was performed, during intravenous anesthesia and 5 minutes after intravenous anesthesia was performed. This research was conducted from April 1 to May 31 2021 and the research duration was 2 months.

RESULTS

Participant's Characteristics

Age, gender, ASA physical status, and previous surgery and anesthesia procedure were included in the participant's characteristics analysis in Table 1. Table 1 shows that the majority of respondents were aged between 46 to 65 years (45.0%). There were 26.7%, 25%, and 3.35% respondents who were aged between 12 to 25, 26 to 45, and >65 years, respectively. Thirty-two male (53.3%) and 28 female (46.7%) participated in this study. According to the ASA physical status, 55%, 43.3%, and 1.7% respondents were classified into ASA I, ASA II, and ASA III, respectively. The majority of respondents (81.7%) had never undergone surgery or anesthesia procedure. Only 18.3% respondents reported their history of surgery or anesthesia procedure prior to the current procedure.

Hemodynamic Changes

This section discussed the hemodynamic changes among the patients who undergone intravenous anesthesia induction in the Central Surgical Unit of Level-II Udayana Denpasar Hospital. Based on data in Table 2,

the normal hemodynamic parameters were distributed as follows: 31 (51.7%), 27 (45.0%), 43 (71.7%), and 43 (71.7%) respondents were documented with normal systolic blood pressure, normal diastolic blood pressure, normal MAP, dan normal pulse rate before the intravenous anesthetic induction, respectively. During the intravenous induction, 51 (85.0%), 33 (55.5%), 43 (71.7%), and 44 (73.3 %) respondents were reported with normal systolic blood pressure, low diastolic blood pressure, normal MAP, dan normal pulse rate, respectively. Five minutes after the induction, 49 (81.7%), 43 (71.7%), and 37 (61.7%) respondents were showing normal systolic blood pressure, MAP, and pulse, respectively. However, the majority of respondents were reported with low diastolic blood pressure (43: 71.7%).

Table 1

Characteristics of respondents (n=60)

Characteristics of respondents	n	(%)
Age (years)		
12-25	16	26.7
26-45	15	25.0
46-65	27	45.0
>65	2	3.3
Gender		
Male	32	53.3
Female	28	46.7
ASA Physical Status		
ASA I	33	55.0
ASA II	26	43.3
ASA III	1	1.7
Previous surgery and anesthesia procedures		
Yes	11	18.3
No	49	81.7

Table 2

The Hemodynamic Changes among Respondents (n=60)

Hemodynamic Parameters	Category					
	Normal		Low		High	
	(n)	(%)	(n)	(%)	(n)	(%)
Before the Induction						
Systolic BP	31	51.7	1	1.7	28	46.7
Diastolic BP	27	45.0	21	35.0	12	20.0
MAP	43	71.7	17	28.8	0	0
Pulse	43	71.7	17	28.8	0	0
During the Induction						
Systolic BP	51	85.0	-	-	9	15.0
Diastolic BP	26	43.3	33	55.5	1	1.7
MAP	56	93.3	1	1.7	3	5.0
Pulse	44	73.3	16	26.7	0	0
Five Minutes After the Induction						
Systolic BP	49	81.7	9	15.0	2	3.3
Diastolic BP	15	25.0	43	71.7	2	3.3
MAP	43	71.7	16	26.7	0	0
Pulse	37	61.7	23	38.3	0	0

DISCUSSION

Standard of pre-anesthetic hemodynamic status required prior to induction of intravenous anesthesia. Pre-anesthetic preparation aims to provide physical and physiological endurance before further anesthetic, diagnostic, or surgical procedures [9][20][10].

A normal range of systolic blood pressures was documented during the induction and five minutes after induction among the majority of respondents, with a total of 51 (85.0%) and 49 (81.7%), respectively. Finding also reported a normal MAP during the induction and five minutes after the induction on 56 respondents (93.3%) and 43 (71.7%) respondents, respectively. The normal pulse rate during the induction (44: 73.3%) was also reported among the majority of respondents. Further, a normal MAP was also identified in the majority of respondents (37; 61.7%) five minutes after the induction. The diastolic blood pressure was found lower during the induction (33; 55.5%) and five minutes after the induction (43; 71.7%). This finding was in line with a study conducted by [2]. They discovered that diastolic blood pressure after the induction would be lower compared to the pressure before the induction. In addition, age, gender, pharmacology, and the anesthetic agents may also deliver dilatation effect on the veins. Several works of literature mentioned that blood pressure ideally would be decreased as much as 10% to 20% after the induction. A higher amount of reduction would induce critical situations that may require collaborative interventions from the

anesthesiologist to prevent serious complications [17][20][21].

The anesthetic agent is an essential factor of a hemodynamically stable status during the perioperative stage. Anesthetic agents commonly suppress the myocardium functions and sympathetic activities, decreasing cardiac contraction, stimulating peripheral vasodilatation, and generating hypotension. Systolic blood pressure, diastolic blood pressure, MAP, and pulse rate represent the cardiac output during the induction. They illustrate the accurate hemodynamic status of a patient through a non-invasive technique to prevent serious complications [18][3].

The recent study revealed insignificant changes in the hemodynamic status among the respondents, parallel with a hypothesis from Mangku (2010). Several combinations of anesthetic agents may depress cardiovascular functions, especially propofol, which produces vasodilatation effects on the blood vessels. Propofol administration would reduce the blood pressure and elevate pulse rate to maintain the cardiac output. Ketamine has sympathomimetic characteristics that would increase the blood pressure and pulse rate [20][22][23]. Fentanyl, on the other hand, would preserve the cardiac muscle contractility and vascular tone, maintaining stable hemodynamic status during the intravenous anesthetic induction. Propofol, ketamine, and fentanyl are a typical anesthetic combination administered in an intravenous induction procedure to produce a hemodynamically stable condition [24][25][3].

This study expect the anesthetic nurse to be more careful in monitoring the hemodynamics of patients preoperatively, intraoperatively and postoperatively, because hemodynamic changes occur quickly both immediately after anesthetic drugs are given to patients until they are in the recovery room. Anesthetists a can perform hemodynamic monitoring properly and correctly to prevent critical events that can harm the patient.

The limitations of this study are that researchers still find the use of intravenous induction drugs with different combinations in patients due to consideration of the physiological and pathological conditions of the respondents and the sample of this study is still relatively small and includes only 1 hospital.

CONCLUSION AND RECOMMENDATION

Findings of "The Effect of Intravenous Anesthetic Induction on the Hemodynamic Changes among Patients in Central Surgical Unit of Level-II Udayana Denpasar Hospital" revealed that intravenous anesthetic induction altered the diastolic blood pressure among the majority of the patients. Findings reported that the majority of patients were documented with normal systolic blood pressure (85.0%), normal MAP (93.3%), and normal pulse rate (73.3%) during the intravenous induction. Low diastolic blood pressure was reported among 55.5% respondents during the induction. Further research suggested to add more number of samples involving several hospitals and intravenous induction drugs can be

homogenized. For Nurse anesthetist to monitor hemodynamics properly and correctly to prevent critical events that can harm the patient.

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