

# **The most commonly used intravenous anesthetic drugs for induction of general anesthesia by anesthesiologists in Misurata hospitals**

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## **Abstract:**

The purpose of the present study is to evaluate the most commonly used intravenous anesthetic drugs for induction of general anesthesia by anesthesiologists in Misurata hospitals. There was a total of 40 anesthesiologists. The respondents were worked in different hospitals in Misurata (public and private hospitals). Questionnaires were distributed to anesthesiologists in June 2021. Most of the respondents were those with more than ten years of experience (40%), and that (75%) of them work in both public and private hospitals. The study showed that the most common intravenous drugs in general anesthesia for induction are propofol (60%) and ketamine (37.5%), and one of the reasons for choosing them as the most common intravenous drugs in general anesthesia for induction is their availability, safety, cheapness and fast induction. This study revealed many advantages of these drugs, the most important of which were: potent hypnotic, rapid induction and fast anesthesia. It also has many disadvantages, including pain at injecting and hypotension. The results also showed that (20%) of the anesthesiologists in this study did not use ketamine with propofol in the same case and separate injections. In addition, 80% of them use propofol with ketamine on the same case and in different injections, because of its advantages, the most important of which is that it is effective in pediatric and cases of low blood pressure. As for the use of ketamine and propofol in the same injection (ketofol), all the anesthesiologists in this study denied their use of it for several reasons, the most important of which are unavailable and no previous experience. The most common intravenous drugs for induction are propofol and ketamine. Also in this study, we concluded that there is a mixture of propofol and ketamine used in developed countries and it is called ketofol and has multiple advantages and fewer disadvantages compared to using ketamine only or propofol only.

**Keywords:** General Anesthesia, induction, intravenous drugs, Misurata hospitals.

## أدوية التخدير الوريدية الأكثر شيوعاً لتحريض التخدير العام من قبل أطباء التخدير في مستشفيات مصراتة

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### الملخص:

الغرض من هذه الدراسة هو تقييم الأدوية المخدرة الوريدية الأكثر شيوعاً لتحريض التخدير العام من قبل أطباء التخدير في مستشفيات مصراتة. كان هناك ما مجموعه 40 طبيب تخدير. عمل المبحوثون في مستشفيات مختلفة في مصراتة (مستشفيات عامة وخاصة). تم توزيع الاستبيانات على أطباء التخدير عام 2021. معظم المبحوثين هم من تزيد خبرتهم عن عشر سنوات (40%) وأن (75%) منهم يعملون في المستشفيات العامة والخاصة. أظهرت الدراسة أن أكثر الأدوية الوريدية شيوعاً في التخدير العام لتحريض هي البروبوفول (60%) والكيثامين (37.5%)، وأحد أسباب اختيارهما كأكثر الأدوية الوريدية شيوعاً في التخدير العام لتحريض هو توفرهما، الأمان، التكلفة الرخيصة والاستقرار السريع. كشفت هذه الدراسة عن العديد من المزايا لهذه الأدوية، من أهمها: لهما تأثير منوم فعال، التحريض السريع والتخدير السريع. كما أن له العديد من العيوب، بما في ذلك الألم عند الحقن وانخفاض ضغط الدم. كما أظهرت النتائج أن (20%) من أطباء التخدير في هذه الدراسة لم يستخدموا الكيثامين مع البروبوفول في نفس الحالة وفي حقن منفصلة. بالإضافة إلى أن 80% منهم يستخدمون البروبوفول مع الكيثامين في نفس الحالة وفي حقن مختلفة، لما له من مزايا وأهمها أنه فعال في الأطفال وحالات انخفاض ضغط الدم. أما بالنسبة لاستخدام الكيثامين والبروبوفول في نفس الحقن (الكيثوفول)، فقد نفى جميع أطباء التخدير في هذه الدراسة استخدامهم له لعدة أسباب، أهمها غير متوفر ولا يوجد خبرة سابقة لديهم بالخصوص. إن أكثر العقاقير الوريدية شيوعاً لتحريض هما البروبوفول والكيثامين. أيضاً في هذه الدراسة خلصنا إلى أن هناك مزيج من البروبوفول والكيثامين يستخدم في البلدان

المتقدمة ويسمى كيتوفول وله مزايا متعددة وعيوب أقل مقارنة باستخدام الكيتامين فقط أو البروبوفول فقط.

**الكلمات المفتاحية:** تخدير عام، تحريض، عقاقير وريدية، مستشفيات مصراتة.

### **Introduction:**

Though the ancient Greeks used ineffectual potions and poppy extracts to ablate surgical pain, the origin of anesthesia as we know it today dates to the late 18<sup>th</sup> century. Chemists at that time were beginning to query the nature of several gases that emerged during fermentation and from heating and acidifying metallic combinations[1,2]. All kinds of anesthesia drugs are administered to retain you relaxed and pain-free during operation, medical procedures or examinations. Nevertheless, there are some key differences. The kind you receive will depend on factors like the procedure, your preference and your health. There are a lot of kinds of anesthesia, general anesthesia, regional anesthesia, and local anesthesia[3]. General anesthesia is a drug that is administered by an anesthesiologist through inhalation or an intravenous placed in the vein. A tube may be placed in your throat to support your breathing. During operation or the procedure, the anesthesiologist will monitor your blood pressure, breathing, heart rate and other vital signs to make sure they are usual and stable while you remain unconscious and amnesic[4]. Patients cannot maintain the airway without help; however, these drugs maintain the airway. General anesthesia is like deep sedation in the absence of protective reflexes and inability to keep the airway, however, it does not respond even to a painful stimulus and cardiopulmonary function may be affected[5]. The purpose of the present study is to evaluate the most commonly used intravenous anesthetic drugs for induction of general anesthesia by anesthesiologists in Misurata hospitals and compare them in terms of side effects and reasons for use.

### **Definition of terms:**

The following terms are defined to provide the reader the correct understanding of the terms used in the study:

**General anesthesia:** it is a therapeutically induced coma and loss of protective reactions caused by the administration of one or more general anesthetic drugs[4].

**Intravenous general anesthesia:** it is an anesthetic drug given through the vein and has a fast onset of action and is rapidly cleared from the bloodstream[4].

**Public hospitals:** it mentions to an institution-owned or operated by the government to provide medical care to patients. In some countries, this kind of

hospital provides medical treatment free of charge, the cost of which is covered by government reimbursement[6].

**Private hospitals:** it refers to an institution-owned or operated by a for-profit company or a non-profit organization and privately funded through payment for medical care by people themselves[7].

**Patient:** this term means any receiver of health care service who most of them ill or injured and needed medical care[8].

**Side effects:** an appreciably harmful or unpleasant reflex, caused by an intervention related to the use of a medical product[9].

**Research Methodology:** The researcher utilized the descriptive design to understand the most commonly used intravenous anesthetic drugs for induction of general anesthesia. There were a total of 40 anesthesiologists. The respondents were worked in different hospitals in Misurata (public and private hospitals) which include :Misurata Medical Center, Alhekma Hospital, Alsafwa Hospital, Aljazeera Hospital, Al Amal Hospital, Sbitar Hospital, Almahjoub Hospital, and National Cancer Institute. Questionnaires were distributed to anesthesiologists in June 2021. The study focused on the most commonly used intravenous anesthetic drugs for induction of general anesthesia. In addition, the advantages and disadvantages for them. Moreover, the years of experience in anesthesia and place of work were included in this study. The findings may be used in planning to manage induction drugs, and discover the complications for these drugs. In this study, we also determined the reasons for choosing the anesthetic drug according to the patient's condition.

**Research instrument:** The research instrument used in the study was a survey questionnaire.

The questionnaire was divided into two parts: **Part I:** consists of the profile of the respondents which is composed of two questions including years of experience in the field of anesthesia and the place of work. **Part II:** is the most commonly used intravenous anesthetic drugs for induction of general anesthesia assessment instrument which is consists of six items. Item 1 determined the most common injectable general anesthetic do anesthesiologists use for induction in surgical operations. Item 2 focused on the reasons for choosing these drugs as the most used induction drugs in general anesthesia in surgical operations compared to other general anesthesia drugs. item3 assessed the advantages that have been observed in the most common intravenous medicine in general anesthesia. Item 4 assessed the disadvantages that have been observed in the most common intravenous medicine as induction general anesthesia. Item 5 determined if the respondents used (ketamine+ propofol) in spread syringe and if the answer is yes, in which cases are they used together,

and what is the reason for combining them; and if the answer is no, what is the reason. Item 6 determined if the respondents used (ketamine+ propofol) (ketofol) in the same syringe and if the answer is yes, in which cases are they used together in the same syringe, and what is the reason for combining them; and if the answer is no, what is the reason.

**Data gathering procedure:** The researchers secured all necessary permission from concerned authorities in the conduct of the study. The data for this study were collected by distributing questionnaires to a group of anesthesiologists in different hospitals in Misurata, and that is after the approval of the letter submitted to the hospital was taken. The questionnaires were handed over to the anesthesiologists through the head of the department in the hospital and were received from them.

**Statistical treatment and data analysis:** The data gathered were classified, tabulated and analyzed. The researcher used frequency, percentage distribution as a statistical tool. Such a tool shows the number of observations falling in each range or the percentage observations. It is used to find out the incidence of the most commonly used intravenous anesthetic drugs for induction of general anesthesia and the advantages and disadvantages in different hospitals in Misurata, Libya. Tables and pie graphs were also used to describe the information gathered from the research study.

**Search criteria:** anesthetic drug must be an intravenous drug, the anesthetic drug must be for induction of general anesthesia, and the respondent must be an anesthesiologist.

**Search location:** Misurata Central Hospital, Alhekma Hospital, Alsafwa Hospital, Aljazeera Hospital, Al Amal Hospital, Sbitar Hospital, Almahjoub Hospital, and National Cancer Institute. Questionnaires were distributed to anesthesiologists in June 2021.

### **Results:**

This part deals with the presentation of the data gathered from the respondents through the assessment of the most commonly used intravenous anesthetic drugs for induction of general anesthesia for this study. Frequency, percentage and weighted mean were used as statistical treatments. The results guided the researcher in making recommendations; finding out the most commonly used intravenous anesthetic drugs for induction of general anesthesia in a different hospital in Misurata, Libya. The information gathered from the participants is presented in the form of tables. The questionnaire consists of two parts, part I addressed the profile variables of the respondents, and part II consist of the most commonly used intravenous anesthetic drugs for induction of general anesthesia and their advantages and disadvantages.

**Profile of the respondents:**

**Years of experience:**

Table (1): Frequency and percentage of distribution of respondents according to years of experience

| Years of experience |       | Frequency | Percent |
|---------------------|-------|-----------|---------|
| Valid               | 1-5   | 12        | 30.0%   |
|                     | 6-10  | 12        | 30.0%   |
|                     | >10   | 16        | 40.0%   |
|                     | Total | 40        | 100.0%  |

The above table shows the frequency and percentage distribution of respondents according to years of experience. The result reveals that 40% (n=16) of the respondents have more than ten years of experience working in the field of anesthesia. 30% (n=12) of the respondents have from 1-5 years of experience working in the field of anesthesia, in the same time 30% (n=12) of the respondents have from 6-10 years of experience working in the field of anesthesia. This finding explains that most of the respondents have more than ten years of work experience.

**Place of work:**

Table (2): Frequency and percentage of distribution of respondents according to the place of work

| Place of work |         | Frequency | Percent |
|---------------|---------|-----------|---------|
| Valid         | private | 2         | 5.0%    |
|               | public  | 8         | 20.0%   |
|               | both    | 30        | 75.0%   |
|               | Total   | 40        | 100.0%  |

Table (2) shows the frequency and percentage distribution of respondents according to their place of work. The result disclosed that 75% (n=30) of the anesthesiologists targeted in this study work in the public and private sectors. While about 5% (n=2) of the anesthesiologists in this study work in the private sector only, and 20% (n=8) of the anesthesiologists targeted in this study work in the public sector only. These results show that the vast majority of anesthesiologists work in the public and private sectors, while a very small percentage, not exceeding 5%, works in the private sector only.

### **Injectable general anesthetic do you use for induction in surgical operations:**

Table (3): Frequency and percentage of injectable general anesthetic do you use for induction in surgical operations

| <b>Injectable general anesthetic do you use for induction in surgical operations</b> |            | <b>Frequency</b> | <b>Percent</b> |
|--|------------|------------------|----------------|
| Valid  | Propofol   | 24               | 60.0%          |
|  | Ketamine   | 15               | 37.5%          |
|  | Thiopental | 1                | 2.5%           |
|  | Total      | 40               | 100.0%         |

The above table shows the frequency and percentage distribution of injectable general anesthetics that use for induction in surgical operations. The result reveals that propofol is the most commonly used injectable general anesthetic which is used for induction in surgical operations with 60% (n=24). While ketamine came in at 37.5 % (n=15) Where they were focused on the study. While thiopental came in at 2.5% (n=1). In addition, through these results, we note that propofol and ketamine are the most commonly used.

### **The reasons for using it as a common drug for induction:**

Table (4): Frequency and percentage of the reasons for using it as a common drug for induction

| <b>The reasons for using it as a common drug for induction</b> |  | <b>Frequency</b> | <b>Percent</b> |
|--|--|------------------|----------------|
| Valid  | cheap  | 4                | 10.0%          |
|  | safe   | 9                | 22.5%          |
|  | available  | 11               | 27.5%          |
|  | fast induction                                       | 11               | 27.5%          |
|  | more than reason                                     | 4                | 10.0%          |
|  | good anesthetic for patients with low blood pressure | 1                | 2.5%           |
|  | Total  | 40               | 100.0%         |

Looking at the table above, we note the reasons for choosing these drugs as the most commonly used for induction in general anesthesia. Where the results showed us that most of the reasons were that they are available and fast-induction, as the percentage of each of them reaches (27.5%) (n=11). (22.5%)

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(n=9) safe, (10%) (n=4) cheap, (2.5%) (n=1) good anesthetic for patient low blood pressure, and (10%) (n=4) there are more than answer. This result tells us that the most common reason to use these medications compared to others is that they are available and have fast induction.

### **The advantages that have been observed in the most common intravenous medicine:**

Table (5): Frequency and percentage of the advantages that have been observed in the most common intravenous medicine

| <b>The advantages that have been observed in the most common intravenous medicine:</b> |                            | <b>Frequency</b> | <b>Percent</b> |
|--|----------------------------|------------------|----------------|
| Valid  | Rapid induction & recovery | 28               | 70.0%          |
|  | Hemodynamic stability      | 1                | 2.5%           |
|  | Potent hypnotic            | 3                | 7.5%           |
|  | Fast anesthesia            | 3                | 7.5%           |
|  | Available & cheap          | 3                | 7.5%           |
|  | Relax & easy intubation    | 2                | 5.0%           |
|  | Total                      | 40               | 100.0%         |

The above table shows the frequency and percentage of the advantages that have been observed in the most common intravenous medicine. Finding reveals that the most common advantage of these drugs is rapid induction & recovery, which came at (70%) (n=28). In addition to other advantages that came at a rate of (7.5%) (n=3) for each, these advantages are potent hypnotic, fast anesthesia, and available & cheap. In addition, relax & easy intubation (5%) (n=2), and hemodynamic stability (2.5%) (n=1). This result explains that the most common advantages for induction drugs that focused on this study are rapid induction & recovery.

**The disadvantages that have been observed in the most common intravenous medicine:**

Table (6): Frequency and percentage of the disadvantages that have been observed in the most common intravenous medicine

| <b>The disadvantages that have been observed in the most common intravenous medicine</b> |  | <b>Frequency</b> | <b>Percent</b> |
|--|--|------------------|----------------|
| Valid  | Hypotension  | 20               | 50.0%          |
|  | Pain at injection                                      | 7                | 17.5%          |
|  | Hemodynamic instability                                | 2                | 5.0%           |
|  | Apnea  | 3                | 7.5%           |
|  | Respiratory depress                                    | 1                | 2.5%           |
|  | no hallucination                                       | 2                | 5.0%           |
|  | less side effect on old age                            | 2                | 5.0%           |
|  | propofol may cause allergy & ketamine delayed recovery | 1                | 2.5%           |
|  | short anesthesia                                       | 2                | 5.0%           |
|  | Total  | 40               | 100.0%         |

The above table shows the frequency and percentage of the disadvantages that have been observed in the most common intravenous medicine. Finding reveals that the most common disadvantage of these drugs is hypotension, which came at (50%) (n=20). In addition to other disadvantages that pain at injection at (17.5%) (n=7), Apnea (7.5%) (n=3), hemodynamic instability, hallucination, side effect on old age, and short anesthesia came at a rate of (5%) (n=2) for each. Respiratory depression and propofol may cause allergy & ketamine delayed recovery came at a rate of (2.5%) (n=1) for each. This finding reveals that Low blood pressure is at the forefront of the disadvantages of these drugs, which we seek through this study to find a solution to prevent.

**Advantages using ketamine- propofol (spread):**

Table (7): Frequency and percentage of the advantages using ketamine-propofol (spread)

| <b>Advantages using ketamine- propofol (spread):</b> |   | <b>Frequency</b> | <b>Percent</b> |
|--|---|------------------|----------------|
| Valid  | Fast induction  | 2                | 5.0%           |
|  | Deep anesthesia   | 2                | 5.0%           |
|  | Hemodynamic stability                                       | 3                | 7.5%           |
|  | More cardiac stability                                      | 2                | 5.0%           |
|  | Fewer side effects of propofol                              | 3                | 7.5%           |
|  | If the patient blood pressure low                           | 7                | 17.5%          |
|  | Use in pediatric  | 9                | 22.5%          |
|  | Doesn't use it  | 8                | 20.0%          |
|  | Good analgesic  | 1                | 2.5%           |
|  | Propofol for release hallucination                          | 1                | 2.5%           |
|  | More cardiac stability & decrease hallucination of ketamine | 2                | 5.0%           |
|  | Total   | 40               | 100.0%         |

The table shows the frequency and percentage of advantages observed when using ketamine with propofol in different injections. The results showed that (20%) (n = 8) did not use propofol with ketamine at all. While (22.5%) (n = 9) confirm its effectiveness in pediatrics' cases, compared to the use of each drug alone. And (17.5%) (n = 7) confirmed its use in the case of low blood pressure in the patient. Hemodynamic stability and fewer side effects of propofol (7.5%) (n=3) for each. Fast induction, deep anesthesia, more cardiac stability, and decrease hallucination of ketamine (5%) (n=2). This finding explains that the most important advantages of administering propofol with ketamine are in pediatrics' cases as well as in patients who have low blood pressure (hypotension).

**Using ketofol mixture (ketamine+ propofol) in the same syringe:**

Table (8): Frequency and percentage of using ketofol mixture (ketamine+ propofol) in the same syringe

| <b>Frequency and percentage of using ketofol mixture (ketamine+ propofol) in the same syringe</b> |                                      | <b>Frequency</b> | <b>Percent%</b> |
|---|--------------------------------------|------------------|-----------------|
| Valid   | Unavailable & no previous experience | 40               | 100.0%          |

These results reveal that not all anesthesiologists in this study use ketofol in the same syringe. This is for many reasons, some of the anesthesiologists have no idea that they are used in the same syringe, nor do they have any information that ketamine and propofol can be mixed in one syringe. While there are a few anesthesiologists who have extensive experience in the field of anesthesia, they have information that developed countries use the mixture of propofol and ketamine in the same syringe and mix them; They emphasized its effectiveness and the lack of side effects but also stressed that it should not be used because it is not available ready (mixed) and they do not have enough information on how to mix them, and there are no companies that have approved mixing ketamine with propofol.

### **Summary of Findings:**

Most of the respondents were those with more than ten years of experience (40%), and that (75%) of them work in both public and private hospitals. The study showed that the most common intravenous drugs in general anesthesia for induction are propofol (60%) and ketamine (37.5%), and one of The results also showed that (20%) of the anesthesiologists in this study did not use ketamine with propofol in the same case and separate injections. In addition, 80% of them use propofol with ketamine on the same case and in different injections, because of its advantages, the most important of which is that it is effective in pediatric and cases of low blood pressure. As for the use of ketamine and propofol in the same injection (ketofol), all the anesthesiologists in this study denied their use of it for several reasons, the most important of which are unavailable and no previous experience.

### **Discussion:**

Through this study that we conducted in public and private hospitals and clinics in the city of Misurata, we concluded that there are intravenous drugs commonly used in general anesthesia, including Propofol, which is used by 60% and ketamine, which is used by 37.5% in hospitals and public and private clinics. Similar result was reported in related study; Susan and others, 2013 found that Propofol and ketamine have been used in practice as an induction agents for cesarean section. In addition, there have not been any reports of problems directly at tribute to the drugs themselves; the reasons for choosing them as the most common intravenous drugs in general anesthesia for induction is their availability, safety, cheapness and fast induction[10]. This study revealed many advantages of these drugs, the most important of which were: potent hypnotic, rapid induction and fast anesthesia. On the other hands, these drugs have many disadvantages, including pain at injecting and hypotension. These results supported the previous study which reported propofol causes a

decrease in blood pressure, the onset of action of ketamine is rapid; an intravenous dose of 2 mg/kg of body weight usually produces surgical anesthesia within 30 seconds after injection, with the anesthetic effect usually lasting 5 to 10 minutes[11,12]. According to related studies, we investigated ketofol is effective in inducing deep venous sedation, and it is a wonderful combination between two sedative drug compounds, each of which has a different mechanism of action from the other, and achieves hemodynamic balance in the patient, adequate sedation, and a relatively faster recovery compared to ketamine[5]. Literature and clinical practice showed that ketamine sequencing combined with propofol can give full play to their respective advantages characterized by smooth induction, no injection pain, good analgesia, less respiratory depression, stable hemodynamics, fewer stress response, and fast recovery[13,14]. Both propofol-ketamine combination produce rapid and safe anesthesia with minor hemodynamic fluctuations[15]. Therefore, it may be recommended that propofol-ketamine can be used as combination in TIVA for day care surgeries where minimal side effects and early recovery are desired[16]. According to related studies, we discovered that there is a mixture of propofol and ketamine used in developed countries and it is called ketofol and has multiple advantages and fewer disadvantages compared to using ketamine only or propofol only. In addition, through the relevant studies, the combination of ketamine and propofol is more effective and safer than the use of propofol alone, and thus ketofol becomes preferred. We concluded that Anesthesiologists in Misurata Hospitals do not use the ketofol mixture because they do not know enough about it and it is not available. Moreover, they use ketamine and propofol for the same patient and in the same process are separate, because propofol causes a drop in blood pressure and ketamine raises blood pressure, which leads to balance in blood pressure.

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