COMPARISON OF EFFECT OF DEXMEDETOMIDINE WITH KETOFOL AND KETOFOL ALONE ON QUALITY OF SEDATION IN PAEDIATRIC PATIENTS UNDERGOING MAGNETIC RESONANCE IMAGING (MRI): A PROSPECTIVE RANDOMIZED CONTROLLED DOUBLE BLIND TRIAL

THESIS

Submitted to

All India Institute of Medical Sciences, Jodhpur

In partial fulfillment of the requirement for the degree of

DOCTOR OF MEDICINE (MD)

(ANAESTHESIOLOGY AND CRITICAL CARE)

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JULY 2020

AIIMS, JODHPUR

DECLARATION

I hereby declare that the thesis titled **"Comparison of Effect of Dexmedetomidine with Ketofol and Ketofol alone on quality of Sedation in Paediatric Patients undergoing Magnetic Resonance Imaging (MRI): A Prospective Randomized Controlled Double Blind Trial"** embodies the original work carried out by me at All India Institute of Medical Sciences, Jodhpur.

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CERTIFICATE

This is to certify that the thesis titled **"Comparison of Effect of Dexmedetomidine with Ketofol and Ketofol alone on quality of Sedation in Paediatric Patients undergoing Magnetic Resonance Imaging (MRI): A Prospective Randomized Controlled Double Blind Trial** is the bonafide work of **Dr. REENA CHAKRAVARTY** carried out under our guidance and supervision at Department of Anaesthesiology and Critical care
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ACKNOWLEDGEMENT

"The starting point of all achievement is desire"

-Napoleon hill

First and foremost, I would like to thank God Almighty for giving me the strength, knowledge, and ability to undertake this research study and to persevere and complete it satisfactorily. Without his blessings, this achievement would not have been possible.

I am deeply grateful and my proud privilege to express my deep sense of gratitude and sincere thanks to my thesis guide Dr. Rakesh Kumar, Associate Professor, Department of Anaesthesiology and Critical Care, AIIMS, Jodhpur who provided me with an opportunity to work under his guidance. His guidance was paramount in providing a well-rounded experience and knowledge. He has always been a source of encouragement and inspiration. I wish to express my deep in debt gratitude for devoting his valuable time out of his busy schedule and being concerned for the completion of this project. I shall remain grateful to him forever.

I express my sincere gratitude to Dr. Pradeep Kumar Bhatia, Professor and Head, Department of Anaesthesiology and Critical Care, AIIMS, Jodhpur, who always stood as a pillar of support and steered me through the difficult times.

I also express my sincere gratitude to Dr. Swati Chabbra**,** Additional Professor**,** Department of Anaesthesiology and Critical Care, AIIMS, Jodhpur; Dr. Manoj Kamal**,** Additional Professor**,** Department of Anaesthesiology and Critical Care, AIIMS, Jodhpur and Dr. Sadik Mohammed, Additional Professor**,** Department of Anaesthesiology and Critical Care**,** AIIMS, Jodhpur for their constant support, encouragement, guidance and help throughout my work. I am grateful for the constant

encouragement and enthusiasm for ensuring that no patient matching my inclusion criteria is missed, helping me finish my thesis in time.

I am also extremely thankful to my colleagues Dr. Susri Mishra, Dr. Sachith Raju, Dr.Akhil Dr. Shreya neogy, Dr.Pavana Gokhale and Dr.Chitra Saun, Dr. Mrityunjaya, Dr. Manish ,Dr.Navin ,Dr.Athul ,Dr.Shahid with whom I worked closely and puzzled over many similar problems. I am very grateful for their presence during my difficult times. A special thanks to all my amazing juniors and my seniors at the Department of Anaesthesiology and Critical Care, AIIMS, Jodhpur for their selfless help during my day-to-day work.

Most importantly, I would like to thank my Parents, my brother my sister for their constant support, encouragement, and unconditional love. My special acknowledgement goes to all those people who made possible the difficult task of completing my MD thesis. My warm appreciation is due to all the Anaesthesiology staff and technicians who cooperated in my long working hours. At last, words are short to express my deep sense of gratitude to all the participants who willingly and selflessly participated in my thesis during my research endeavour.

Dr. Reena Chakravarty

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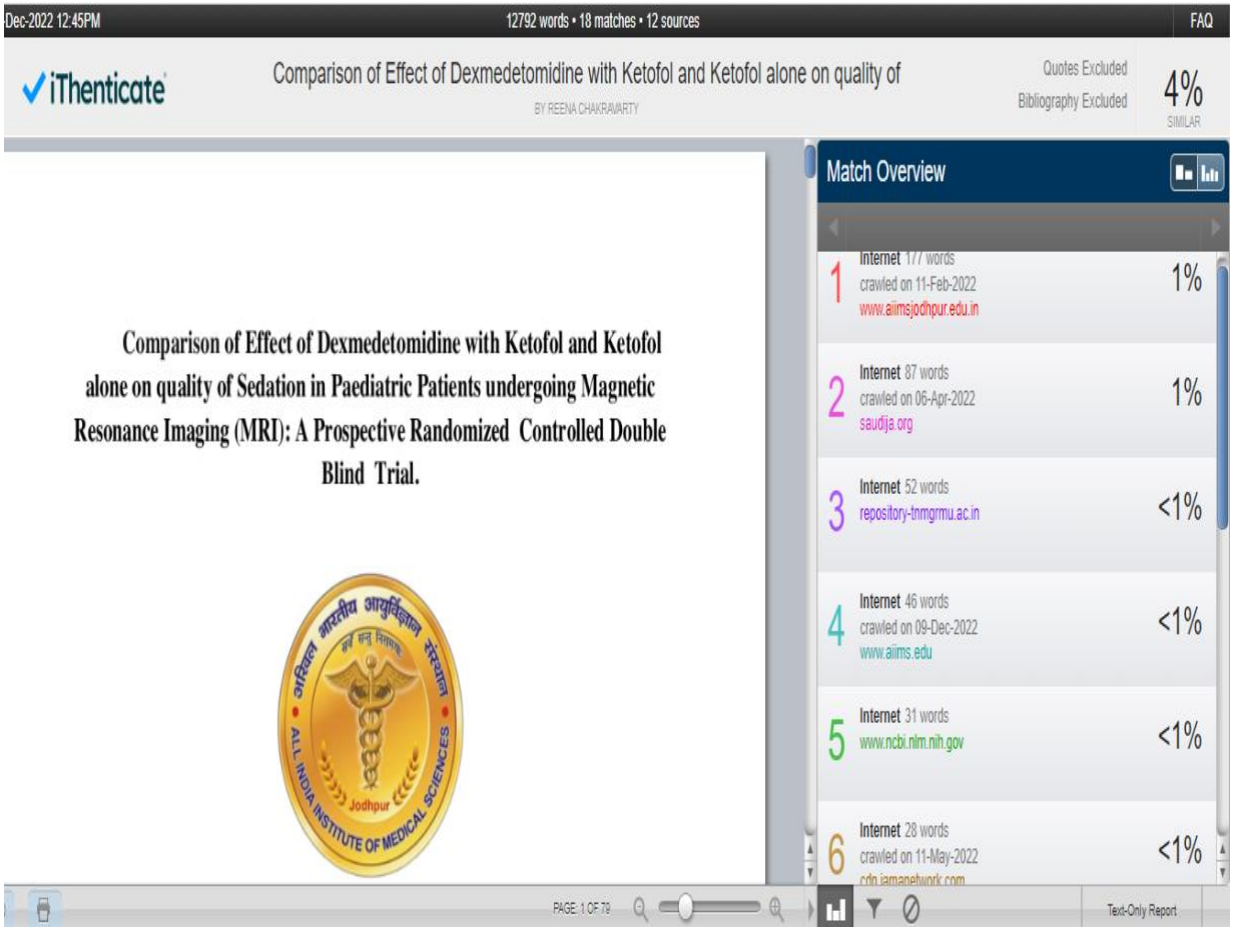
PLAGIARISM CHECK CERTIFICATE



SUMMARY

Introduction - Patient movement during an MRI is the most frequent cause of artifacts and poor scan quality. Children cannot lie still, thus anesthesia is frequently required to keep the child calm and immobile until the imaging procedure is complete. This is because even a tiny movement may necessitate repeating the entire succeeding sequence.

This randomized double-blinded clinical trial compares the clinical effects of the addition of dexmedetomidine as premedication with ketofol on the quality of sedation. We hypothesized that addition of the dexmedetomidine will improve sedation quality

Methods – After getting institutional ethical committee approval and parents' consent, children aged 6 months to 10 years were randomized into groups KD & K. The DK received an intravenous bolus of dexmedetomidine (0.5mcg/kg) as premedication. In both groups, ketofol was used as an induction agent(0.5mg/kg), and maintenance infusion of propofol was started via infusion pump immediately after induction @ 100mcg/kg/min. University of Michigan Sedation Scale was used for assessing the sedation. In case of child movement or signs of a light anesthesia bolus dose, propofol (0.5 mg/kg) was given as rescue sedation. Outcomes were quality of sedation, image quality, the requirement of rescue propofol dose, recovery, and adverse events. Data are given as median (IQR) or frequency.

Results: All 132 children completed MRI scans. The DK group showed significantly better quality of sedation 71% vs 47 % of children; median difference 1 (-0.569 to -0.0969); $P < .005$), the better quality of scan, reduced number of additional doses of propofol as well as a decreased total dose of propofol. Hemodynamic parameters and

recovery times for the 2 groups were similar. There were no significant side effects in both group.

Conclusion:

According to our study, groups DK & K experienced great quality sedation at rates of 71% and 47%, respectively. The quality of sedation and the quality of the MRI scan are greatly improved by administering dexmedetomidine (0.5 mcg/kg) 10 minutes before to induction. The significant advantage of this technique is decreased need for additional propofol dose and better hemodynamic stability without delaying recovery time

INTRODUCTION

Magnetic Resonance Imaging (MRI) is a commonly prescribed non-invasive, non-radiating diagnostic imaging tool. The patient has to lay still for 45-60 min in a claustrophobic environment with high acoustic noise in the MRI room, which can be disturbing to patients, especially those who are younger. An immobile patient is essential for a high-quality MRI scan since movement is the most frequent cause of artifacts and image distortion. [1,2] Pediatric patients are unable to lie still. Thus, sedation is frequently necessary to keep the child calm and still until the imaging is complete. [3]

Many medications, including propofol, ketamine, and thiopentone, are frequently used for sedation in MRI rooms independently or in combination. Propofol, a sedative-hypnotic agent, is one of many sedative medications used for sedation and is popular due to its quick action, quick recovery, and antiemetic effects. Propofol may not be enough to keep the infant immobile, thus, further doses may be needed. These additional doses may have a depressive effect on the respiratory system and reduce the child's protective airway reflexes. [4,5]

Ketamine has the ability to provide quick sedation and efficient analgesia, with a stable hemodynamic profile and minimal respiratory depression. [6] Although ketamine may have benefits, its potential adverse effects, which include hypertension, tachycardia, vomiting, nausea, a bothersome "emerging" phenomenon, and excessive salivation, have prevented it from being widely accepted. [7,8]

Ketofol combination of ketamine and propofol in the same syringe is being utilized frequently for procedural sedation in the pediatric population. By enhancing safety and

efficacy and allowing for a reduction in the quantity of propofol required to achieve sedation, the antagonistic hemodynamic and respiratory actions of each medication may boost the value of this pharmacological combination. They are frequently utilized for pediatric procedures such as cardiac catheterization, interventional radiology, oncological treatments, hematological procedures and MRI sedation. [9-12]

Dexmedetomidine is a selective alpha-2 adrenergic agonist which has been used for MRI sedation as a sole agent as well as an adjuvant with other agents in pediatric patients. It has been found to decrease not only propofol requirement but also the need for airway support and provide better hemodynamic stability. [13,14]

The addition of dexmedetomidine with ketofol has never been compared in pediatric patients for MRI sedation. We hypothesized that a bolus of dexmedetomidine with ketofol induction would provide better sedation quality throughout the procedure and reduce propofol requirement during the maintenance of sedation.

REVIEW OF LITERATURE

Tammam et al. [15], in a randomized trial, compared the efficacy of dexmedetomidine and whether given intramuscular or intravenous for pediatric MRI sedation. Ninety children between the ages of 2 and 8 years with ASA physical status I–II, scheduled for elective MRI, were randomly divided equally into two equal groups. Group DV, sedation was performed using IV dexmedetomidine hydrochloride; a loading dose of 1 mcg/kg was administered over 10 min, followed by a continuous infusion at 1 mcg/kg/h. Group DM, where the patient received IM dexmedetomidine 3mcg/kg. Primary endpoints included the incidence of failed sedation and the requirement of midazolam supplementation. Secondary endpoints were time to sedation, duration of sedation, discharge time, and hemodynamic status. In their results, they found that the sedation failure rate was significantly higher in the DV group (40%) in comparison with the DM group (20%) (P =0.04). Also, the use of rescue midazolam was significantly higher in the VD group (0.37± 0.47 mg) in comparison to the DM group (0.17 ± 0.35 mg) (P = 0.025). The onset of satisfactory sedation was significantly shorter in DV group in comparison to DM group (7.93± 0.884 vs. 16.87± 4.49). Also, the discharge time was significantly less in the DV group (32.27 ±3.04 min) in comparison to DM group (41.87± 5.80 min). Patients in DV group had significantly lower MBP compared to patients in DM group after receiving dexmedetomidine ($p < 0.05$). Although the HR decreased in both groups during the MRI study, the decrease was statistically significant in the DV group compared to the DM group in the period extended from the 2nd to 35th min ($p < 0.05$). They concluded that In pediatric MRI sedation, although IM dexmedetomidine does have a late sedation onset; it reduces the sedation failure rate, the need for supplement sedation, and the incidence of hemodynamic instability associated with IV dexmedetomidine

Sethi et al. [16] compared the discharge time after pediatric magnetic resonance imaging (MRI) following Sedation with propofol infusion doses of 100, 75, and 50 mcg/kg/min given after a bolus dose of ketamine and propofol. They included one hundred children of American Society of Anesthesiologists status 1/2, aged 6 months to 8 years, scheduled for elective MRI were enrolled and randomized to three groups to receive propofol infusion of 100, 75, or 50 mcg/kg/min (Groups A, B, and C, respectively). After premedication of children with midazolam 0.05 mg/kg intravenous (i.v.), sedation was induced with a bolus dose of ketamine and propofol(1 mg/kg each), and the propofol infusion was connected. During the scan, heart rate, non-invasive blood pressure, respiratory rate, and oxygen saturation were monitored. They found that the primary outcome, that is, discharge time was shortest for Group C (44.06 ± 18.64 min) and longest for Group A (60.00 ± 18.66 min), the difference being statistically and clinically significant. The secondary outcomes, that is, additional propofol boluses, scan quality, and awakening time, were comparable for the three groups. The systolic blood pressure at 20, 25, and 30 min was significantly lower in Groups A and B compared with Group C. The incidence of sedation-related adverse events was highest in Group A and least in Group C. They concluded that after a bolus dose of ketamine and propofol (1 mg/kg each), a propofol infusion of 50 mcg/kg/min provided sedation with the shortest discharge time for MRI in children premedicated with midazolam 0.05 mg/kg, IV. It also enabled stable hemodynamics with fewer adverse events.

Pedersen et al. [17] compared propofol-remifentanil with sevoflurane for the maintenance of anesthesia in children aged 1–10 years, American Society of Anesthesiologists physical status 1–2. After induction with thiopental or sevoflurane, the children were randomized to the maintenance of anesthesia with an infusion of propofol and remifentanil (group PR) (56 μg/kg/min of propofol and 0.06 μg/kg/min of

remifentanil) or with sevoflurane 1.3 MAC (group S). A binasal catheter was placed in group PR and a laryngeal mask airway in group S. The children breathed spontaneously. The Paediatric Anaesthesia Emergence Delirium (PAED) score (primary end point), the number of movements during MRI, and the length of stay in the recovery room (secondary endpoints) were recorded. Sixty children were included in each group. A lower level of emergence delirium (measured as a lower PAED score) was found in group PR compared with group S, and the children in group PR were discharged earlier from the recovery room than the children in group S. However, 15 children in group PR vs. 0 in group S moved during the scan ($P < 0.001$). They found that the PR infusion ensured a satisfactory stay in the recovery room, but additional boluses were necessary during the MRI. Sevoflurane was reliable during the MRI, but emergence delirium was a concern.

Christopher et al [18] compared the incidence of adverse events and perioperative physiologic responses in children anesthetized with these 2 regimens. They included one hundred-fifty healthy children, ages 1 to 10 years, were randomized to receive either a propofol infusion (starting at 300 μg kg−1 · min-1) with oxygen via nasal cannula ($n = 75$)or isoflurane with 70% N2O in oxygen delivered via an LMA ($n = 75$), both after a sevoflurane/ N2O/oxygen induction. Adverse airway events, as well as hemodynamic, respiratory, and other physiologic responses, were recorded during the magnetic resonance imaging scans and in the postanesthesia care unit by a single research nurse who was blind to the treatments. All parents were contacted postoperatively to complete a postanesthetic follow-up. They found that all 150 children completed their scans. The frequency of all adverse airway events during

emergence and recovery after propofol (12%) was significantly less than that after isoflurane/

N2O/LMA (49%) (95% confidence interval for the risk difference was 23%–50%) (*P* = 0.0001). Hemodynamic responses and recovery times for the 2 treatments were similar. Early recovery, defined as the time interval from admission to the postanesthesia care unit until eye-opening and wakefulness (modified Aldrete score >5), after propofol was more rapid than that after isoflurane/N2O/LMA (*P* = 0.0001 and *P* = 0.0012, respectively). No scans had to be repeated. They concluded that the frequency of adverse airway events during emergence and recovery after propofol infusion with oxygen by nasal cannula is less than with isoflurane/N2O/LMA in children

Schmitz et al. [19], in a double-blinded randomized clinical trial, compared the clinical effects of propofol-mono-sedation vs. a combination of propofol and ketamine at induction and a reduced propofol infusion rate for maintenance in children undergoing diagnostic magnetic resonance imaging. Children aged from 3 months to 10 years scheduled as outpatients for elective magnetic resonance imaging with deep sedation were included and randomized into 2 groups, receiving either 1 mg/kg ketamine at induction, then a propofol infusion rate of 5 mg/kg/h or a propofol infusion rate of 10 mg/kg/h without prior ketamine. Time to full recovery (modified Aldrete score = 10) was the primary outcome. Further outcomes were quality of induction, immobilization during image acquisition, recovery, postoperative nausea and vomiting, the emergence of delirium using the Pediatric Anesthesia Emergence Delirium scale, vital signs, and adverse cardiorespiratory events. All patients and parents, as well as anesthetists, imaging technicians, and post-sedation personnel, were blinded. Data are given as

median (range). They found that a total of 347 children aged 4.0 (0.25-10.9) years, weighing 15.6 (5.3-54) kg, ASA classification I, II, or III (141/188/18) were included. The ketamine-propofol group showed significantly shorter recovery times (38 (22-65) vs. 54 (37-77) minutes; median difference 14 (95% CI: 8, 20) minutes; P < .001), the better quality of induction, and higher blood pressure, but a higher incidence of movement requiring additional sedative drugs. There were no significant differences in respiratory side effects, cardiovascular compromise, the emergence of delirium, or postoperative nausea and vomiting. They concluded that both sedation concepts proved to be reliable with a low incidence of side effects. Ketamine at induction with a reduced propofol infusion rate leads to faster postanesthetic recovery.

Uludağ et al.[20], in a retrospective study, compare the effects of midazolam-ketamine and midazolam-propofol combinations on hemodynamic stability, patient comfort, and post-anesthesia recovery in pediatric patients undergoing sedation for MRI and also determine the ideal sedation procedure with minimal side effects. They included 40 pediatric patients aged between 2 and 12 years with normal growth and an American Society of Anesthesiology physical status (ASA-PS) 1-2 who were sedated with a combination of midazolam-ketamin or midazolam-propofol for the MRI procedure. The 40 patients were divided into two groups based on the drug combination used for sedation: (I) midazolam-ketamine (M-K) (n = 20) and (II) midazolam-propofol (M-P) (n = 20). Demographic characteristics, duration of MRI procedure, total duration of the procedure, MRI image quality, family satisfaction, peripheral capillary oxygen saturation (SpO2), systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), and Ramsay Sedation Score (RSS) scores were compared between the two groups. Results: they found that no significant difference was detected between the groups with regard to gender, duration of MRI procedure, and total duration of the

procedure. The MRI scanning quality was very good in 14 (70%) and moderately good in 6 (30%) subjects in the M-K group, whereas the scanning quality was very good in 9 (45%) and moderately good in 11 (55%) subjects in the M-P group. There were significant differences between the two groups at different times in terms of SBP, DBP, and HR.

Lepeltier et al [21] in a single-center retrospective cohort study evaluate the feasibility and the efficacy of a dexmedetomidine-based protocol followed by anesthesiologists unaccustomed to using dexmedetomidine during pediatric magnetic resonance imaging (MRI) examinations compared to conventional halogenated general anesthesia. In this they included patients younger than 18 years who underwent sedation for MRI between August 1, 2018 and March 31, 2019. Patients who received dexmedetomidine were included in the DEX group and patients who had general anesthesia formed the GA group. Patients were matched with a ratio of 2 GA:1 DEX, based on age and type of MRI examination. Overall, 78 patients were included (DEX=26; GA=52). Dexmedetomidine was significantly associated with a decrease in invasive ventilation ($p<0.001$) with no impact on image quality. The sedation failure rate was 42% with dexmedetomidine vs. 0% with general anesthesia ($p<0.001$). All cases of failure followed the intranasal administration of dexmedetomidine. They concluded that Dexmedetomidine seems to be a suitable sedation option for pediatric MRI. It provides an alternative to halogenated general anesthesia with the aim of limiting exposure to conventional anesthetic agents and invasive ventilation.

Liaudanskytė K et al[22] retrospectively analyzed 87 cases of pediatric sedations for MRI. Dexmedetomidine and a single dose of midazolam were used in all the cases, according to the in-house pediatric sedation protocol for MRI. All patients were divided

in to 2 groups: group 1, who reached adequate sedation up to 10 min of induction and group 2, who achieved proper sedation after 10 min. found that The median age was 3 years (0-17). The median duration of procedure was 75 min (40-150). The induction of standardized sedation was performed without additional sedatives and proper depth of sedation was reached in the majority of cases (94.3%). Five patients (5.7%) received additional sedative after 10 min of induction. The median time of adequate sedation was 8 min (3-13) after induction, and 51% of patients achieved RASS-4 in 8 min. There was no significant difference between groups 1 and 2. Ten patients (11.5%) experienced bradycardia, regardless of the usage of additional drugs, dexmedetomidine boluses, duration of the procedure, or induction time. They concluded that high-dose dexmedetomidine with a single dose of midazolam might be an effective combination at the induction stage for pediatric sedation for MRI, with very few adverse events. Over 50% of enrolled patients achieved an adequate level of sedation before 10 min.

Wei Liu MD et al [23]did prospective randomized control study. A total of 336 children scheduled for 3.0T MRI but were inadequately sedated after initial intranasal dexmedetomidine (3 μg/kg) were randomly divided into two groups.Methods We used the following protocol for each group: group S, inhalation of low-dose sevoflurane (end-expiratory concentration, 0.4%) through a face mask; group K, intranasal ketamine (2 mg/kg). The success rates were compared between groups as the primary endpoint. The induction time, scan time, recovery time, time to return to baseline functional status, parental and radiologist satisfaction, occurrence of adverse events, and other secondary endpoints were also compared.Findings Successful rescue sedation in groups S and K was achieved in 160 (95.2%) and 138 (82.1%) patients, respectively. Compared with group K, group S needed fewer repeat sequences and showed a significantly shorter induction time (5.7 ± 0.5 vs. 10.9 ± 2.7 min; $P < 0.001$),

recovery time (27.4 ± 6.3 vs. 53.8 ± 15.2 min; ***P*** < 0.001), and time to return to baseline functional status (3.4 ± 0.6 vs. 6.1 ± 1.1 h; ***P*** < 0.001). Radiologist satisfaction, parental satisfaction, and parental desire to repeat the same sedation method were significantly higher in the sevoflurane group. Conclusion Our results suggest that the inhalation of low-dose sevoflurane through a face mask can provide effective and safe rescue sedation in 1- to 6-year-old outpatient children undergoing MRI, and yields a higher success rate, shorter induction and recovery times, and higher satisfaction than the intranasal ketamine method.

Jackson TJ et al [24] Audits of sedation success for children attending planned MRI using three different approaches: (1) National Institute for Health and Care Excellence (NICE) guidance (chloral hydrate if <15 kg and oral midazolam if ≥15 kg), (2) Chloral hydrate for all patients, (3) Chloral hydrate±intranasal dexmedetomidine if <15 kg and intranasal dexmedetomidine alone if ≥15 kg.found 74 patients had 85 MRI scan attempts. Overall success rates were significantly higher when using intranasal dexmedetomidine compared with following NICE guidance (81% vs 52% p=0.017). Dexmedetomidine performed better than oral midazolam for the same indication (76% vs 33% p=0.026). The side effect profile for dexmedetomidine was as reported in larger studies.So, Intranasal dexmedetomidine is an effective alternative to oral midazolam for sedation for MRI and as a rescue medication where chloral hydrate has been ineffective.

AIMS & OBJECTIVES

The present study aimed to compare the effect of addition of dexmedetomidine to ketofol based sedation during MRI in pediatric patients

Primary objective

1. To compare the quality of sedation Provided with ketofol alone and ketofol/dexmedetomidine combination in pediatric patient undergoing MRI. The quality of sedation was measured by the subjective scale.

Secondary objectives

1. To compare the quality of the scan
2. To compare the amount and number of rescue dose of propofol required for maintenance of sedation
3. To compare the duration of sedation
4. To compare Recovery time
5. To compare hemodynamic stability in children
6. To compare the incidence of adverse effects

MATERIALS AND METHOD

The present study was carried out in the department of Anaesthesiology and Critical Care at AIIMS, Jodhpur after getting approval from institutional ethics committee [Institutional Ethics Committee, All India Institute of Medical Sciences, Jodhpur 342005 (Raj.); Certificate Reference Number: AIIMS/IEC/2021/3330 date 12/03/2021 approved by Dr. Praveen Sharma] and informed written consent from parents. We registered the study prospectively at the clinical trial registry of India (CTRI: www.ctri.nic.in) [(Ref. No. CTRI/2021/06/034211) Date of Registration: 14/06/2021, Patient Enrolment date:19/06/2021].

Children aged between 06 months to 10 years, belonging to the American Society of Anesthesiologists (ASA) physical status class I and II, and scheduled for MRI on an outpatient basis, were included in this study.

Parent's refusal, patients with raised intracranial pressure, seizures, difficult airway, laryngomalacia, neck mass, congenital heart disease, gastroesophageal reflux disease, renal or hepatic dysfunction, any psychiatric disorder, allergy or contraindication to study drug, patients requiring intubation, anticipated scan time less than 30 min & more than 1.5 hours were excluded from the study.

All patients had undergone pre-anaesthesia check-ups before the scan.They were kept fasting pre-procedure, according to pediatric fasting guidelines. Baseline heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), respiratory rate (RR), and oxygen saturation (SpO_2) were recorded upon arrival at the pre-scan room.

Enrolled children were randomly assigned in 1:1 ratio into 2 groups using block randomization technique. Equal number of blocks of size 4 were used to divide all the patients into two groups (Group DK and Group K). A sealed opaque envelope was used for allocation concealment and opened just before shifting the child inside the MRI room. Parents, anaesthesiologist fellow involved in patients recruitments, sedation and data collection were remain blinded till study completed.

Group DK (n = 66) received an infusion of dexmedetomidine @ 0.5mcg/kg over 10 minutes before induction by infusion pump.

Group K (n = 66) dummy dexmedetomidine syringe containing normal saline by infusion over 10 minutes before induction by infusion pump to maintained observer blindness

After premedication, the child was taken into the MRI room, and SpO_2, ECG, and NIBP monitoring was attached. Injection Ketofol was prepared as a 1:1 mixture of 10 mg/ml of ketamine and 10 mg/mL propofol, drawn into a single 10-mL of syringe. Each millilitre of this solution contains 5 mg of ketamine and propofol. Induction of sedation was done with this solution of ketofol at the rate of 0.5 mg/ kg of either component drug. The sedation level was assessed by using the University of Michigan Sedation scale (UMSS). [25]

University of Michigan Sedation Scale	Score
0	Awake and alert
1	Minimally sedated: Response to verbal conversation or sound
2	Moderately sedated: Arouses to light tactile stimuli
3	Deeply sedated: Arouses to deeper physical stimuli
4	Unarousable to stimuli

UMSS = 2 to 3 was considered an optimum level of sedation for starting the scan. If this level was not achieved, an additional bolus of propofol (0.5 mg/kg) was given to achieve the target sedation score. A maintenance infusion of propofol was started via an MRI-compatible infusion pump immediately after desired UMSS score @ 100mcg/kg/min. The child was then positioned on the scan table, a shoulder roll was placed to maintained patent airway, and oxygen @2 litre/min was given to all the children via face mask. After ensuring the patency of the airway and adequacy of respiration, the scan was allowed to start.

An anesthesia resident not involved in the study was inside the MRI room during the procedure. In case of child movement or signs of light anesthesia (tachycardia, tachypneoa) bolus dose of IV propofol (0.5 mg/kg) was given as rescue sedation & if there was a sign of deep sedation or hemodynamic instability rate of infusion was decreased @10% of the original rate. After completion of the scan, propofol infusion was stopped, and the child was shifted post-anesthesia care unit (PACU). The number of rescue boluses doses of propofol administered during scanning was recorded.

All sedation for MRI was provided by an paediatric anaesthesia fellow. Hypotension was defined as the decrease of MBP >20% from baseline. Bradycardia was defined as a decrease of HR> 20% from baseline. Desaturation was defined as SpO_2 < 95%.

The following parameters were measured during the procedure by a blinded observer.

1. Vitals parameters HR, SpO_2, NIBP, and RR were recorded every 5 minutes till the end of the procedure in the MRI suite, then in PACU
2. Duration of MRI scan (The scan time, that is, time from the start of the scan to its completion)
3. **Quality of sedation assessed by a blinded anesthesiologist**

   Excellent sedation- When there was no patient movement during the scan and did not require any rescue dose of propofol

   Good sedation – When there was a minor movement of the patient, and two or less than two rescue propofol doses required

   Poor sedation When there was a significant patient movement and required more than two rescue doses of propofol.
4. **Quality of scan – Accessed by a single blinded radiologist**

   Excellent- No motion artifacts

   Good- Minor motion artifacts which don't require a repeat scan

   Poor- Major motion artifacts causing scan causing or repeat of one or more scan sequences
5. Number of additional rescues propofol doses required
6. Total amount of propofol used during the procedure
7. Duration of sedation (time in minutes from the beginning of infusion of the drug to the point at which infusion was stopped)

8. Recovery time (time in minutes from the stoppage of infusion to the PACU recovery score over 8 out of 10)
9. Discharge time (when the child attains a modified aldrete score ≥9) was also be noted
10. Side effects, including vomiting, respiratory depression, apnoea, hypotension, hypertension, bradycardia, tachycardia, desaturation events, and allergic reaction, if any, were recorded.

STATISTICAL ANALYSIS

The sample size was calculated based on assuming that 75% of children achieved a sedation score of 3 in the case group and 50% in the control group with 80% power and 5% type 1 error, the sample size was found to be 60 in each group. After an adjustment of 10% dropout sample size in each group is 66.

Data collected during the study was compiled using Microsoft Excel spreadsheets. Normality of data was tested with Kolmogorov– Smirnov one-sample test. Data were presented as median (IQR) (range) for ordinal variables, quantitative variables, and absolute numbers or percentages for categorical variables. Mann Whitney u test was used to analysed ordinal and continuous data. While $\chi 2$ test was used for categorical data.

RESULTS

A total of one hundred fifty patients were assessed for eligibility. Out of them, eighteen patients were excluded for various reasons. The remaining one hundred thirty-two patients were recruited for randomization and equally distributed to two groups, DK and K. Data from one hundred thirty-two patients were included in the analysis in each group. There was no lost to follow-up. Sixty-six patients in each group were available for final primary and secondary outcome analysis (Figure

CONSORT CHART

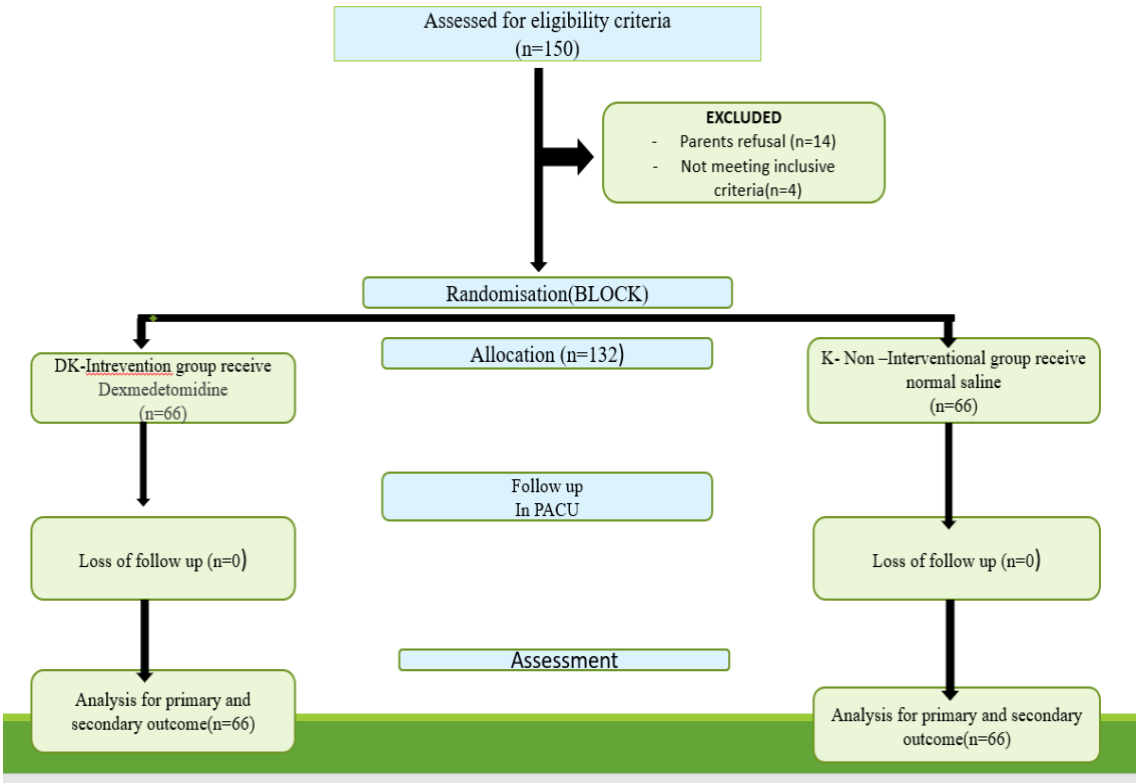


Figure 1: Flow of patients during the study period.

TABLE 1: Distribution of study population according to gender

Gender	Group DK (n=66)	Group K (n=66)	P -Value
Male	46 (69.69%)	41(62.12%)	0.463
Female	20(30.30%)	25(37.87%)	

The above table shows the gender distribution of patients between Group DK and K. In Group DK, 46 patients were male, and 20 patients were female, whereas in Group K, there were 41 patients were male, and 25 patients were female. The chi-square statistic was applied to compare gender between the study groups, which showed a $\chi 2$ value of **0.178**. The corresponding p-value was 0.463 considered to be non-significant i.e., both the study groups were comparable with respect to the gender of the patients.

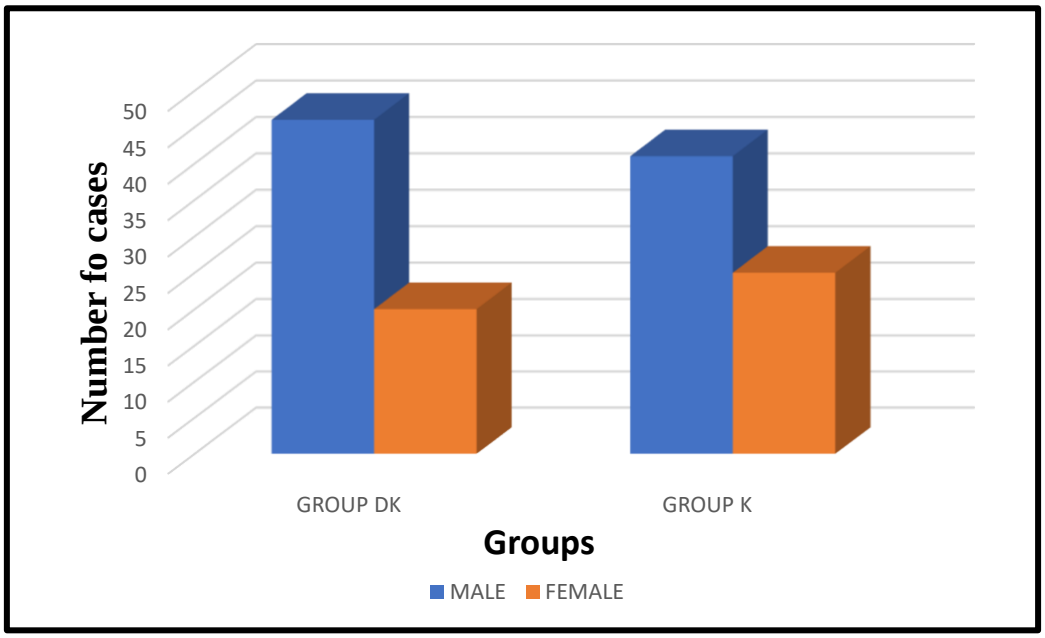


Figure 2: Gender distribution of patients between the two groups

TABLE 2: Distribution and comparison of patients according to age

Age (months)	Number of patients	Group DK	Group K	Median Difference	95% C.I	P- value
6 -24	66	31	33			
25-60	41	19	22			
61-84	13	9	4			
85-120	12	7	5			
Median (IQR) Range	132	36 (12-63) (5-120)	24 (12-60) (5-120)	12	(-6.19 to15.61)	0.394

The above table shows the distribution and comparison of patients according to age. The median (IQR)(range) age distribution in Group DK and K was 36 (12-63) (5-120) months and 24(12-60) (5-120) months, respectively. **The Mann Whitney u**-test was used to compare the age between the study groups, which showed a median difference (95% CI) of 12 (-6.19 to 15.61) between groups with a correspond-value of 0.394 which was statistically non-significant (*P* =. 0.394), which means both the study groups were comparable with respect to the age of the patients.

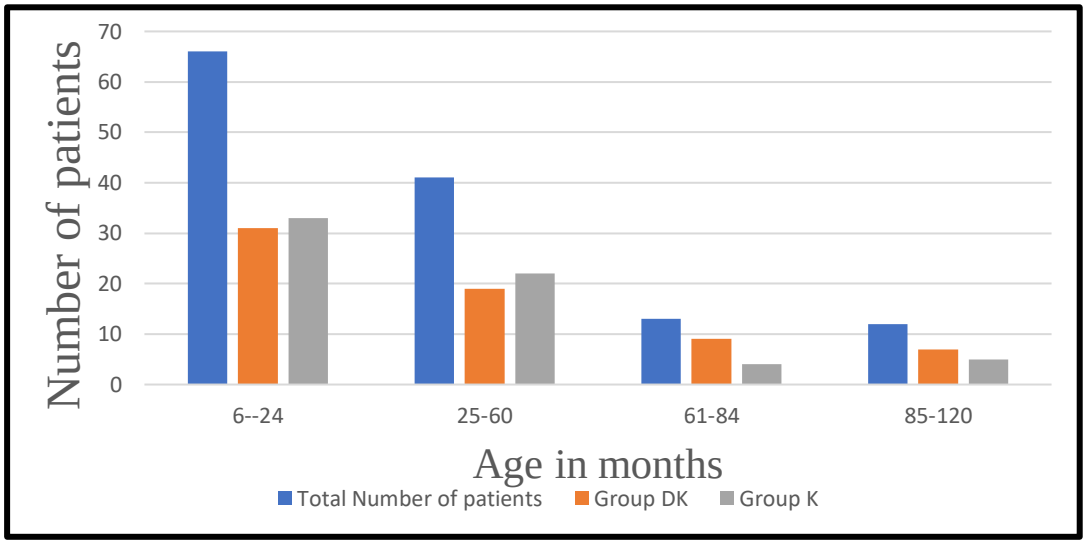


Fig. 3: Distribution of patients according to age between DK and K study groups

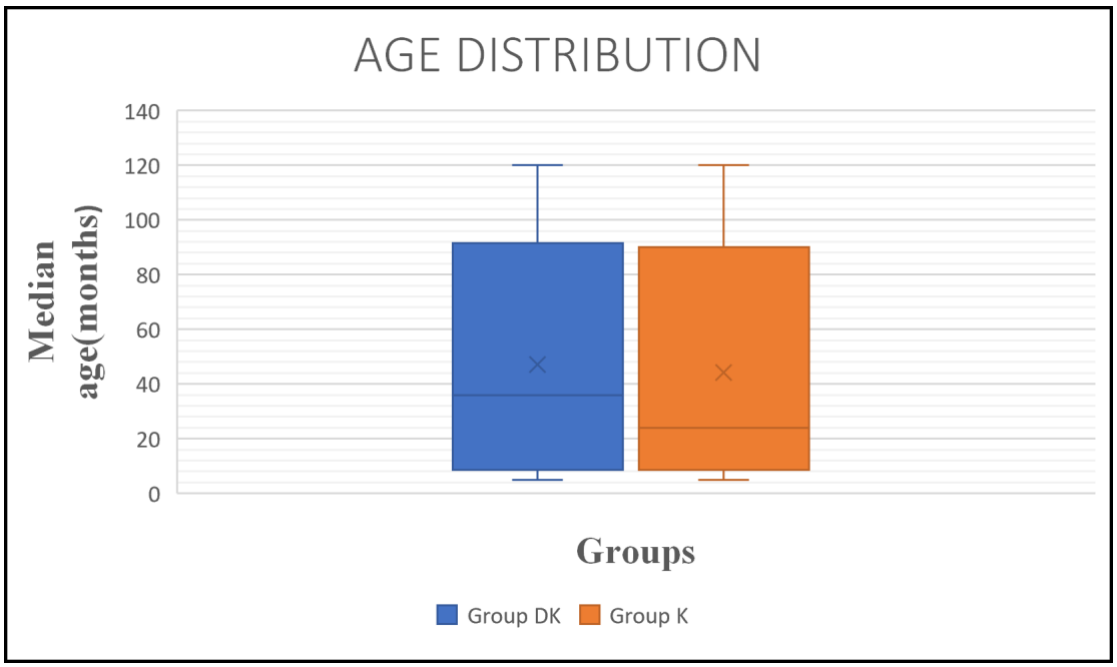


Fig. 4: Comparison of patients according to median age between DK and K study groups

Table 3: Distribution and comparison **of patients according to weight(kg)**

Weight (kg)	Number of patients	Group DK	Group K	Median Difference	95% C.I	P- value
<4.9 kg	3	2	1			
5-9.9 kg	24	15	9			
10 – 19.9 kg	89	36	53			
20-29.9 kg	13	11	2			
>30 kg	3	0	3			
Median (IQR) Range	132	13 (8.85-18) (3.2-25)	13 (10.7-16.2) (7-33)	0	(-2.74 to 1.11)	0.407

The above table shows the comparison of patients according to weight. The median (IQR) weight in **Group DK** was 13(8.85-18) kg, and in **Group K** median (IQR) weight was 13(10.7- 16.2) kg. **The Mann-Whitney u**-test was used to compare the weight between the study groups, which showed a median difference (95% CI) of 0 (-2.74 to 1.11) between groups with a correspond-value of 0.407which was statistically non-significant, which means both the study groups were comparable with respect to the weight of the patients.

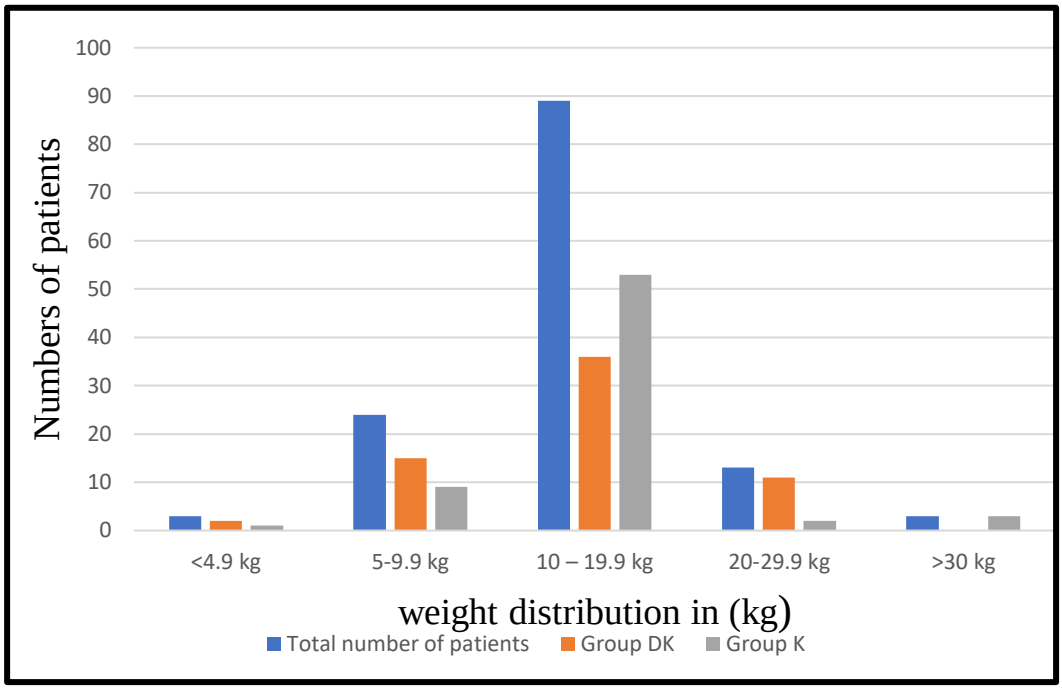


Fig. 5: Distribution of weight division between the two groups

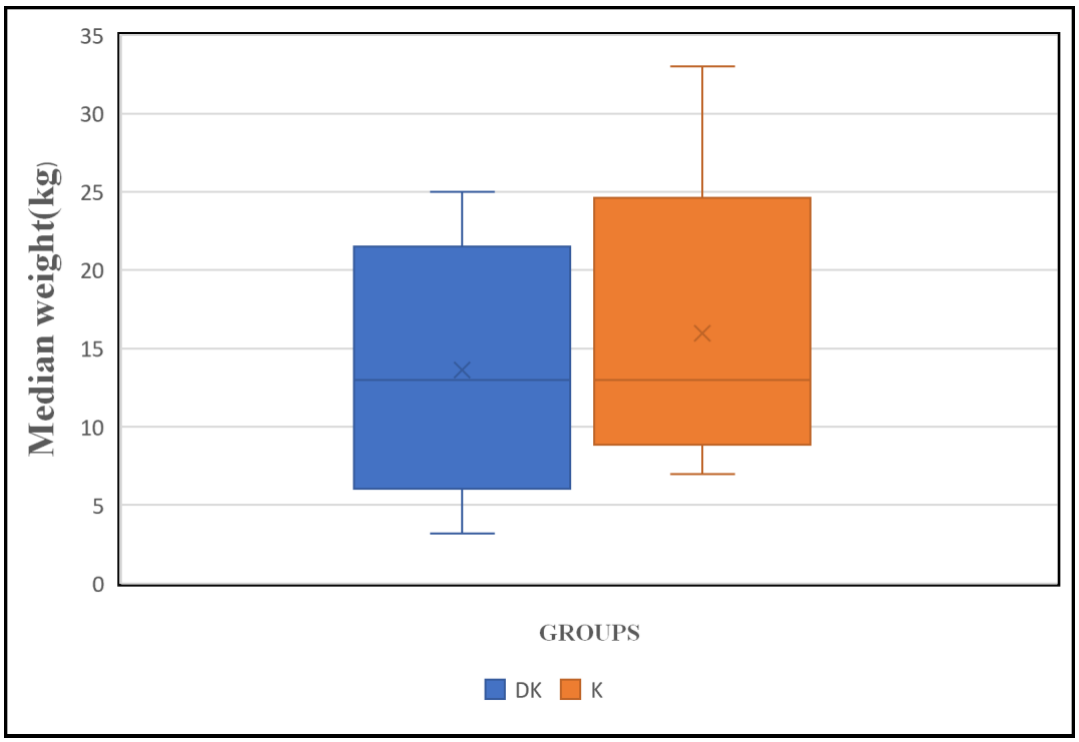


Fig. 6: Comparison of weight between the two groups

Table 4: Distribution of patients according to the MRI site

Image site	Group DK	Group K
Brain and spine	5	6
Brain	58	60
Abdomen and Pelvis	3	0

The above table shows the distribution of the MRI Site between the study groups. Total 132 patients were posted for elective MRI. Out of them 118 patients belonged to the Brain MRI.

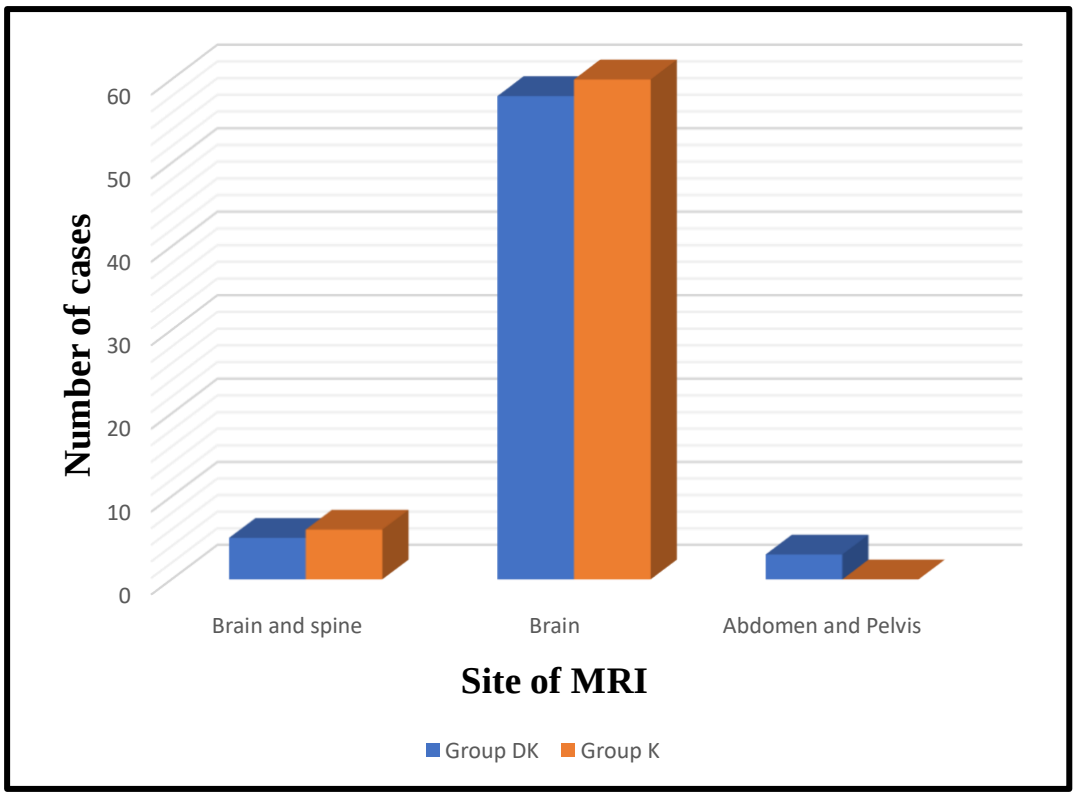


Fig. 7: Distribution of patients according to the Site of MRI

Table 5: Comparison of Median Heart Rate between the groups

Heart rate	DK Group	K Group	Median Difference (95% CI)	P value
Baseline	93(79-100) (66-148)	94(93-96) (72-132)	1(-5.03 to 5.00)	0.995
1MIN	90(83-99) (69-143)	98(89.5-100) (69-134)	8(-6.94 to 2.06)	0.286
5 MIN	90(83-100) (69-148)	95(80-100) (69-134)	5(-3.50 to 7.40)	0.48
10 MIN	90(79.5-96) (69-140)	92(88-98) (69-124)	2(-4.72 to 4.20)	0.909
15MIN	89(80-99) (74-142)	100(78-100) (77-124)	11(-8.15 to 1.37)	0.161
20MIN	90(82.75-99) (75-140)	91(80.75-100) (78-124)	1(-5.29 to 4.14)	0.81
25MIN	90(82.25-100) (75-141)	90(83-101) (75-134)	0(-6.87 to 2.81)	0.409
30MIN	90.5(80-99.25) (69-141)	95(90-100) (69-123)	4.5(-8.08 to 1.68)	0.198
40MIN	92(80-100) (72-138)	99(88-100) (75-134)	7(-7.94 to 1.28)	0.155
50MIN	90.5(80-99.25) (69-141)	95(90-100) (69-123)	4.5(-8.08 to 1.68)	0.198
60MIN	90(82.75-99) (75-140)	91(80.75-100) (78-124)	1(-5.29 to 4.14)	0.81

Median (IQR) Range

The above table shows the comparison of the median heart rate between the study groups at different time intervals. **The Mann-Whitney u** was used to compare the median heart rate at different points of measurement between the study group, which showed that p value was statistically insignificant at all points of measurement.

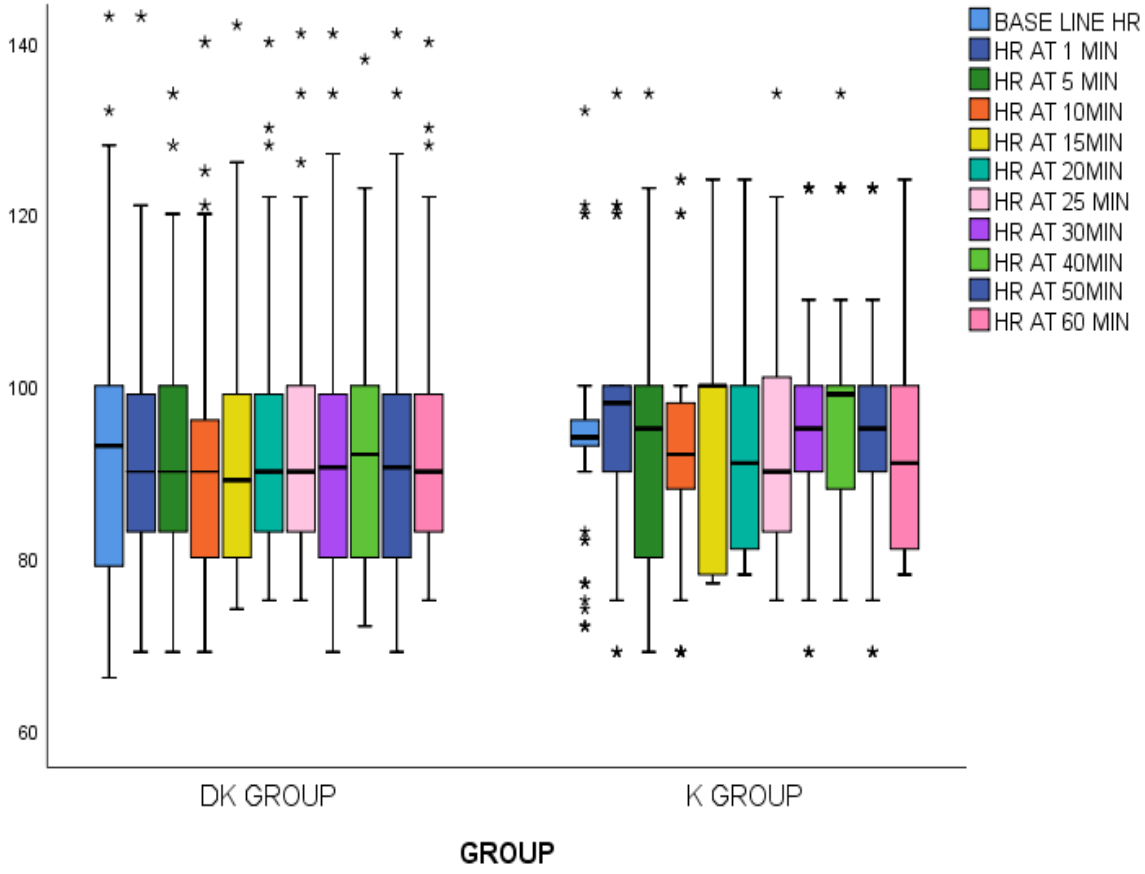


Fig. 8: Comparison of median heart rate between the groups

Table 6: Comparison of Median SPO2 between the groups

SPO2	DK Group	K Group	Median Difference (95% CI)	P value
Baseline	100(99-100) (98-100)	100(99-100) (99-100)	0 (-0.24 to 0.09)	0.38
1MIN	100(99.75-100) (98-100	100(100-100) (98-100)	0 (-0.25 to 0.07)	0.28
5 MIN	100(100-100) (95-100)	100(100-100) (99-100)	0 (-0.39 to 0.03)	0.10
10 MIN	100(99-100) (98-100)	100(99-100) (99-100)	0 (-0.06 to 0.28)	0.23
15MIN	100(99-100) (98-100)	100(100-100) (99-100)	0 (-0.46 to -0.07)	0.56
20MIN	100(99.75-100) (98-100)	100(99-100) (99-100)	0 (-0.20 to 0.17)	0.87
25MIN	100(99.75-100) (98-100)	100(99-100) (99-100)	0 (-0.23 to 0.13)	0.62
30MIN	100(99-100) (98-100)	100(99-100) (99-100)	0 (-0.10 to 0.28)	0.35
40MIN	100(99-100) (98-100)	100(99-100) (99-100)	0 (-0.24 to 0.12)	0.51

Median (IQR) Range

The above table shows the comparison of the median SPO2 between the study groups at different time intervals. The mean SPO2 was calculated at Baseline, 1 min, 5 min, 10 min, 15 min, 20 min, 25 min, 30 min, 40 min, 50 min, 60 min in both the groups **The Mann-Whitney u** was used to compare the SPO2 rate at different points of measurement between the study group, which showed that p value was statistically insignificant at all points of measurement. ($p>0.05$)

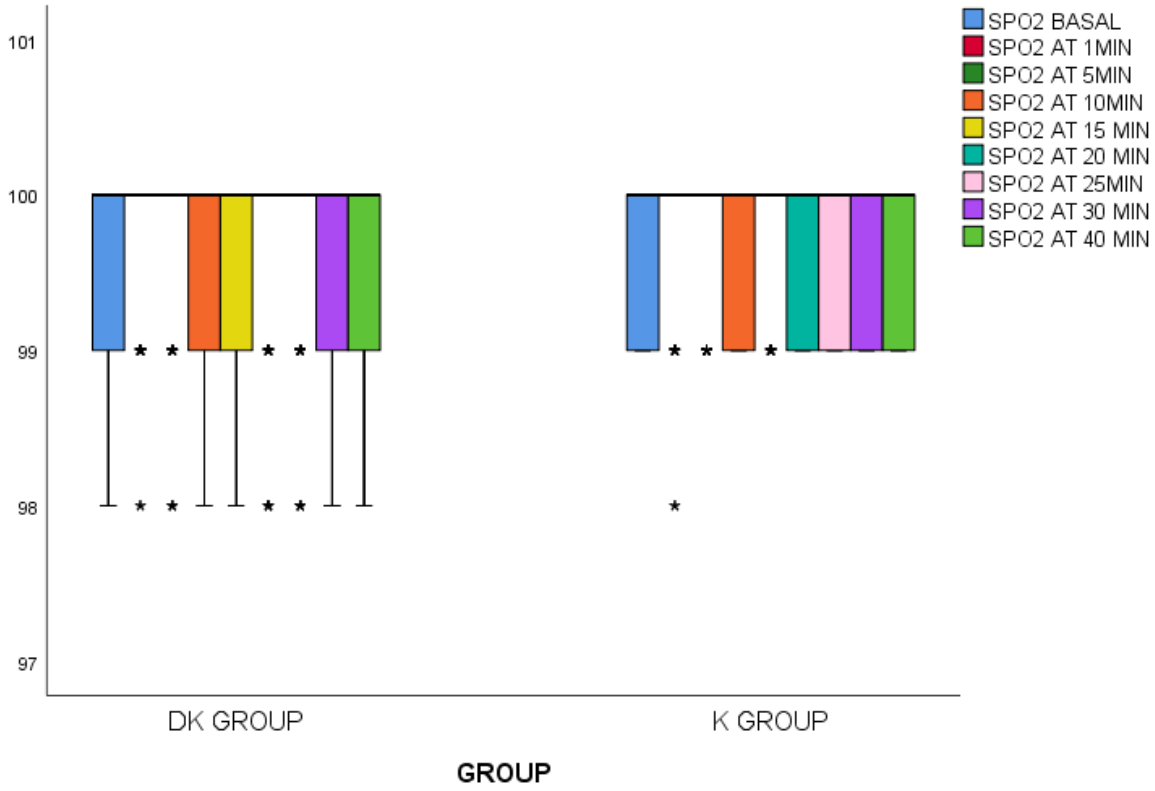


Fig. 9: Comparison of Median SPO2 between the groups

Table 7: Comparison of respiratory rate between the groups

Respiratory Rate	DK Group	K Group	Median Difference (95% CI)	P value
Baseline	27(18-34.25) (14-43)	25(16-33) (14-43)	2(-0.37 to 6.10)	0.76
1MIN	28(18-38) (15-45)	26(16-28) (15-43)	2(-0.17 to 6.29)	0.80
5 MIN	25(16.75-28) (14-43)	25(17-28) (15-40)	0(-1.89 to 3.82)	0.60
10 MIN	26.5(19-28.75) (15-43)	27(19-28) (15-41)	0.5(-2.18 to 3.52)	0.60
15MIN	28(20-38) (14-42)	28(20-31) (14-42)	0(-0.82 to 5.09)	0.50
20MIN	27(21.5-38.5) (14-43)	27(20-30) (16-42)	0(-0.68 to 5.17)	0.50
25MIN	27(21-31.25) (14-43)	25(17-30.25) (15-43)	2(-0.95 to 4.71)	0.64
30MIN	28(18-37) (15-43)	26(18-30) (16-42)	2(-0.31 to 5.52)	0.64
40MIN	28(25-38) (16-43)	28(18-31.5) (16-43)	0(-0.70 to 5.46)	0.15
50MIN	27(21.5-38.5) (14-43)	27(20-30) (16-42)	0(-0.64 to 5.22)	0.15
60MIN	27(21.5-38.5) (14-43)	27(20-30) (16-42)	0(-0.70 to 5.15)	0.13

The above table shows the comparison of the median respiratory rate between the study groups at different time intervals. The respiratory rate was measured at Baseline, 1 min, 5 min, 10 min, 15 min, 20 min, 25 min, 30 min, 40 min, 50 min, 60 min in both the group. **The Mann-Whitney u** was used to compare the respiratory rate at different points of measurement between the study group, which showed that p value was statistically insignificant at all points of measurement. ($p>0.05$)

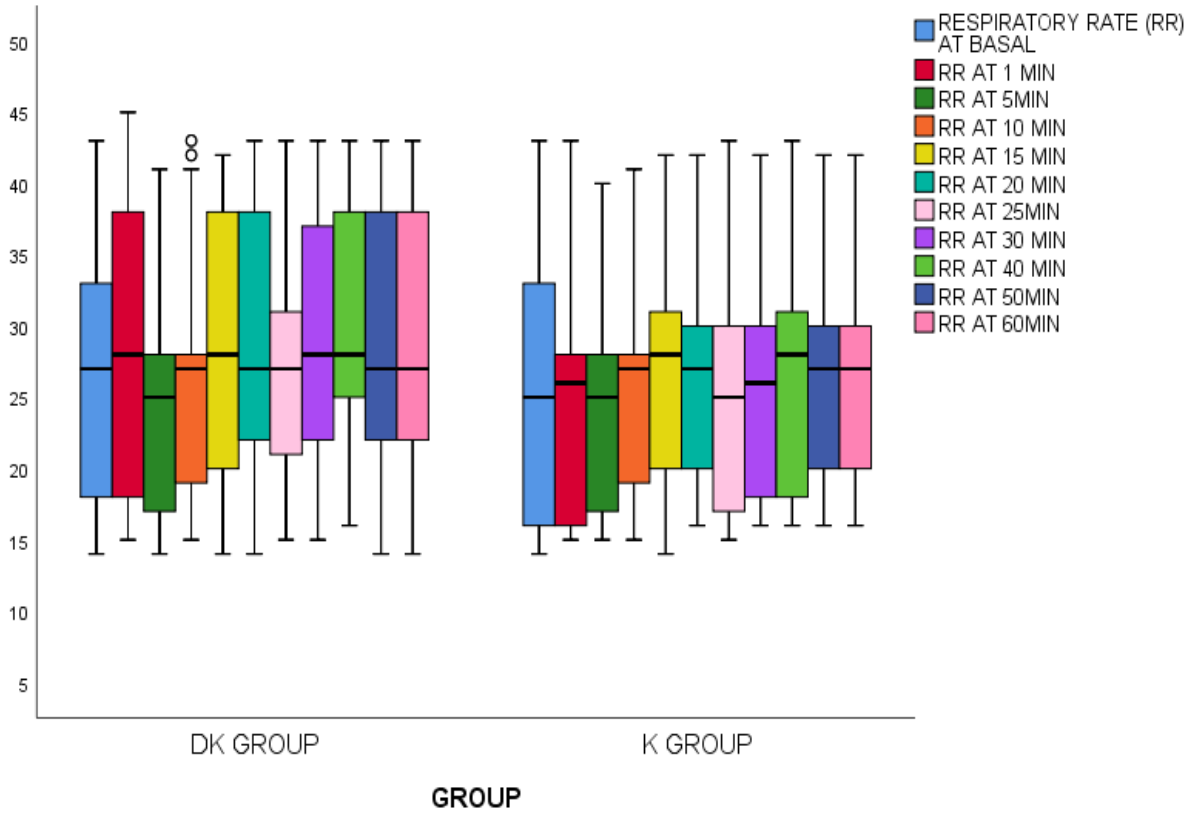


Fig. 10: Comparison of respiratory rate between the groups

Table 8: Comparison of systolic blood pressure between the groups

Time	DK Group	K Group	Median Difference (95% CI)	P value
Baseline	106(99-116.25) (89-128)	104(99-115) (88-120)	(-5.19 to 2.67)	0.529
1MIN	103(99-111.25) (88-130)	101(99-110) (90-120)	(-3.79 to 2.61)	0.716
5 MIN	101.5(99-110) (90-120)	105(100-113) (89-120)	(-2.55 to 2.88)	0.904
10 MIN	102(94-109) (85-122)	102(95-110) (89-120)	(-5.30 to 1.36)	0.245
15MIN	102(98-113) (88-120)	105(98-110) (89-120)	(-2.03 to 4.52)	0.455
20MIN	105(99-110) (88-130)	102(100-114) (95-125)	(-2.11 to 3.90)	0.558
25MIN	105(100-114.25) (89-125)	109(101.5-111.25) (92-120)	(-2.84 to 3.02)	0.951
30MIN	105(100-110) (89-120)	103(99-105) (91-119)	(-4.03 to 1.51)	0.372
40MIN	102(99-110) (89-120)	109(101.5-111.25) (92-120)	(-0.99 to 4.02)	0.235
50MIN	105(100-110) (89-120)	105(98-110) (89-120)	(-4.03 to 1.51)	0.372
60MIN	105(99-110) (88-130)	104(99-115) (88-120)	(-2.11 to 3.90)	0.558

Median(IQR)

The above table shows the comparison of the median systolic blood pressure between the study groups at different time intervals. The systolic blood pressure was measured at baseline, 1 min, 5 min, 10 min, 15 min, 20 min, 25 min, 30 min, 40 min, 50 min, 60 min in both groups. **The Mann-Whitney u** was used to compare the respiratory rate at different points of measurement between the study group, which showed that p value was statistically insignificant at all points of measurement. ($p>0.05$)

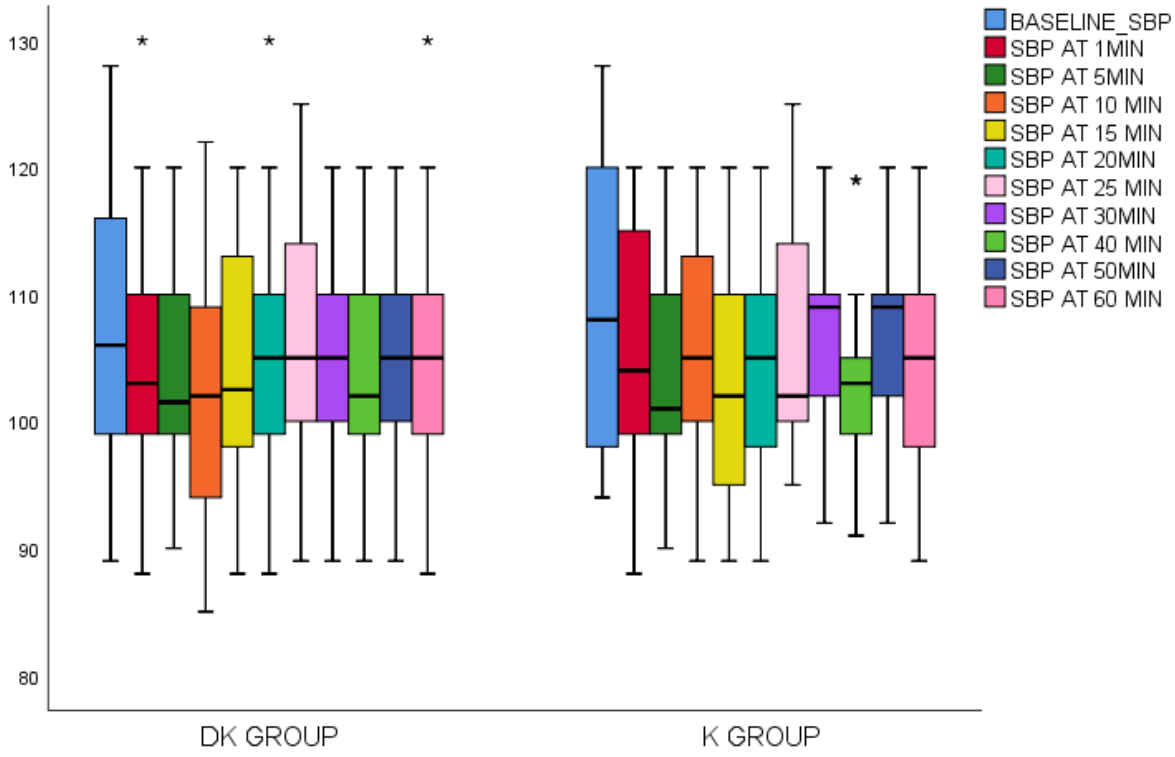


Fig. 11: Comparison of systolic blood pressure between the groups

Table-9: Comparison of diastolic blood pressure between the groups

Time	DK Group	K Group	Median Difference (95% CI)	P value
Baseline	68(60-76) (47-90)	72.5(63-75) (48-78)	(-2.81 to 3.93)	0.743
1MIN	58.5(56-70) (46-90)	59.5(56-68) (48-87)	(-3.23 to 4.84)	0.695
5 MIN	58(56-68) (44-90)	58(56-68) (44-90)	(-4.87 to 3.90)	0.827
10 MIN	57(55-66.25) (45-90)	58(56-64.75) (45-84)	(-3.39 to 3.69)	0.933
15MIN	60.5(57-68) (47-90)	60(57-66) (55-82)	(-1.85 to 4.52)	0.410
20MIN	61(56.75-68) (44-90)	59.5(56-68) (47-90)	(-2.39 to 5.84)	0.408
25MIN	64(57-72.25) (45-88)	64(57-71) (48-80)	(-2.71 to 3.86)	0.730
30MIN	61(57-68) (42-87)	60(57-65) (46-82)	(-1.28 to 4.46)	0.275
40MIN	61(55.75-68) (45-90)	57(52.75-64) (47-90)	(-0.91 to 6.97)	0.131
50MIN	61(57-68) (42-87)	60(57-65) (46-82)	(-1.28 to 4.46)	0.275
60MIN	61(56.75-68) (44-90)	59.5(56-68) (47-90)	(-2.39 to 5.84)	0.408

Median(IQR)

The above table shows the comparison of the median diastolic blood pressure between the study groups at different time intervals. The diastolic blood Pressure was measured at Baseline, 1 min, 5 min, 10 min, 15 min, 20 min, 25 min, 30 min, 40 min, 50 min, 60 min in both the group. **The Mann-Whitney u** was used to compare the diastolic blood pressure at different points of measurement between the study group, which showed that p value was statistically insignificant at all points of measurement. ($p>0.05$)

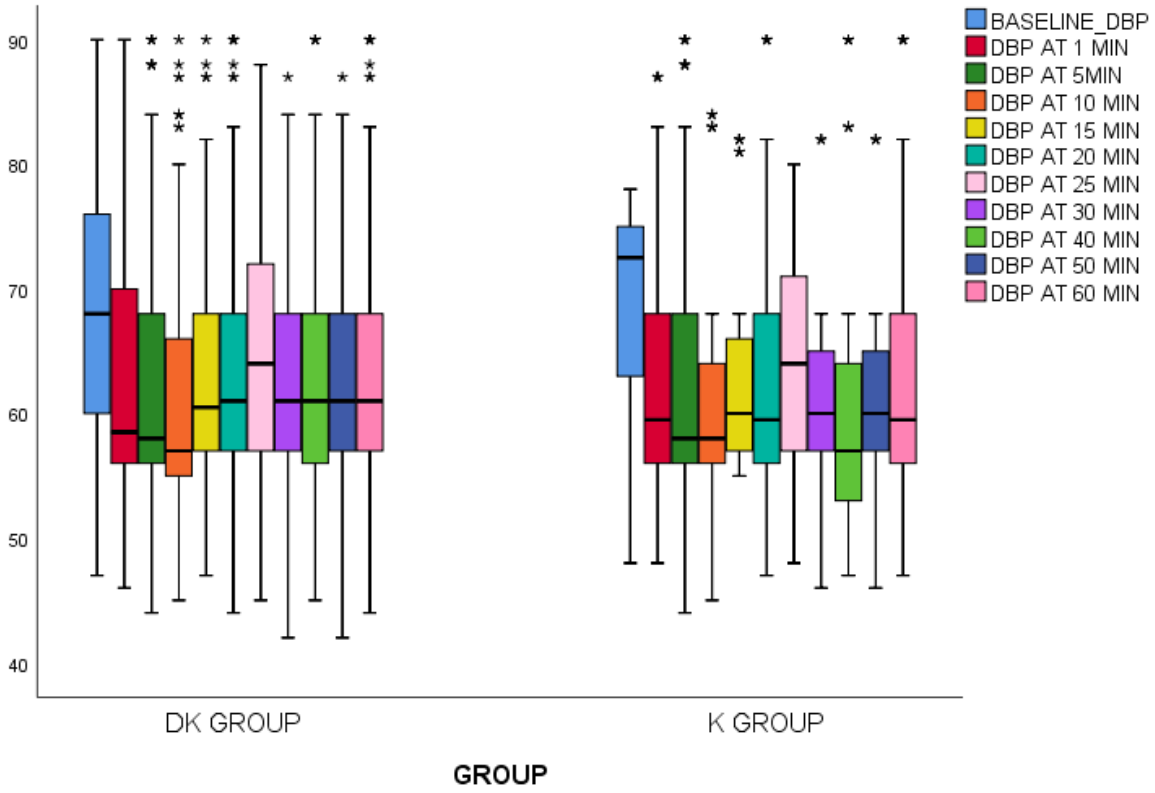


Fig. 12: Comparison of diastolic blood pressure between the groups

Table.10: Comparison of induction dose of ketofol between the study group

Induction dose (mg)	**DK (N=66)**	**K (n=66)**	**Median difference**	**95% CI**	**P-value**
Median (IQR) [Range]	6.5 (4.42-9.0) [1.6-12.5]	6.5(5.37-8.12) [3.5-16.5]	0	(-1.37 to 0.55)	0.407

The above table shows the comparison of the study group according to the induction dose of ketofol. The median (IQR)(range) induction dose of ketofol in Group DK and K was 6.5 (4.42-9.0) [1.6-12.5] mg and 6.5(5.37-8.12) [3.5-16.5] mg, respectively. **The Mann Whitney u**-test was used to compare the induction dose of ketofol between the study groups, which showed a median difference (95% CI) of 0 (-1.37 to 0.55) between groups with a correspond-value of 0.407 which was statistically non-significant, which means both the study groups were comparable with respect to the induction dose of ketofol of the patients.

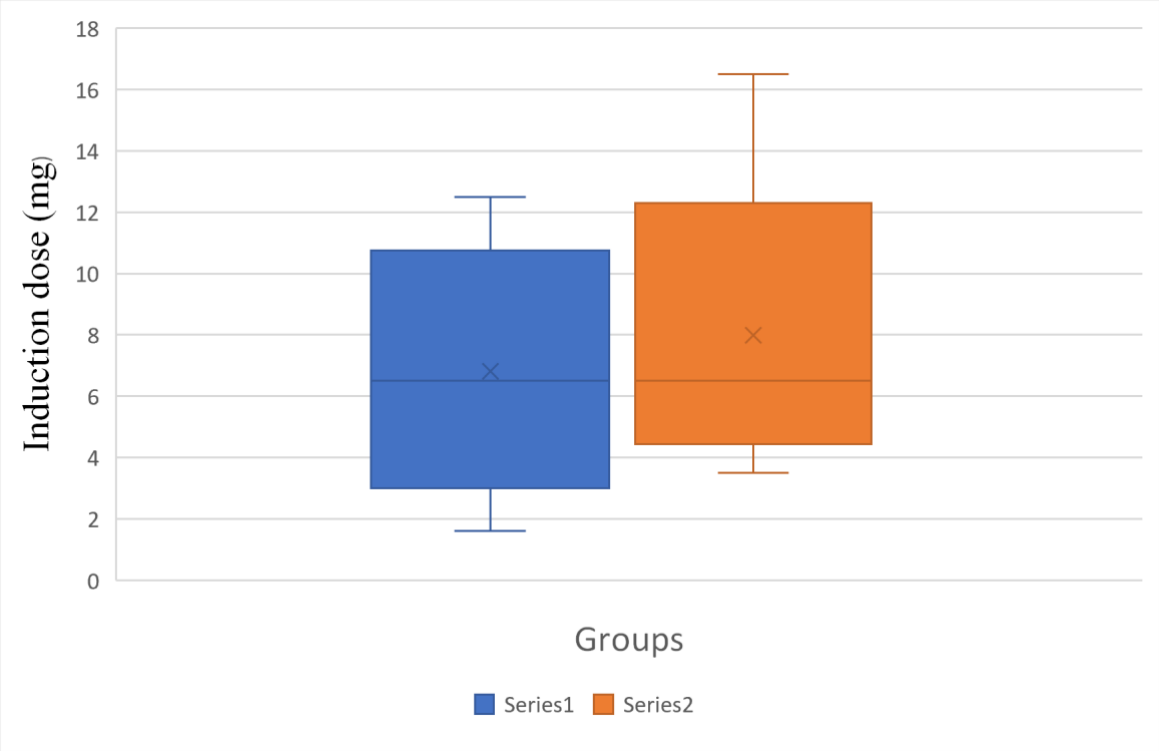


Fig.13: Comparison of induction dose of ketofol between the groups

Table.11: Distribution of patients with different numbers of rescue dose requirements between the groups

Number of rescue dose requirements	DK	K	Chi square	P-value
0	47 (71.2)	23 (34.8)	24.23	<0.001
1	11 (16.7)	5 (7.6)		
2	3 (4.5)	20 (30.3)		
3	5 (7.6)	16 (24.2)		
4	00	2 (3)		
Total	66	66		

The above table shows the distribution of patients with different numbers of rescue dose requirements and a comparison of median number of rescue doses required between the groups. The Chai square -test was used to compare the number of rescue doses required between the study groups, p value obtained was <0.000, which was statistically significant, which means DK group required lesser number of rescue doses compared to K group

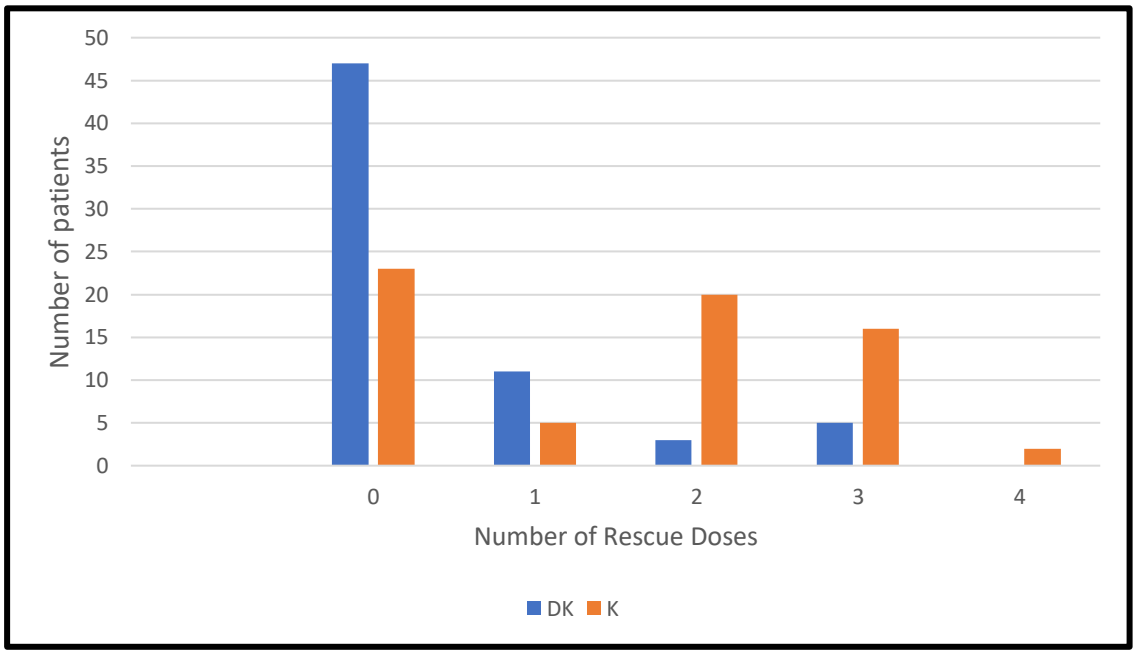


Fig:14. Distribution of number of rescue dose required in groups

Table.:12- Comparison of rescue dose of propofol requirement in study groups

Rescue dose of propofol (mg)	DK	K	Median difference	95% CI	P-value
Median (IQR) Range	0(0.0-5.25) (0.0-33.0)	10.50 (0.0-16.63) (0.0-50)	10.5	-10.862 to -4.305	0.000

The above table shows the comparison of the study group according to the rescue dose of propofol required in study groups. The median (IQR)(range) rescue dose of propofol in Group DK and K was 1 (0.00-5.25) [0.00-33] mg and 10.5 (0-16.63) [0.0-50] mg, respectively. **The Mann Whitney u**-test was used to compare the rescue dose of propofol between the study groups, which showed a median difference (95% CI) of 10.5 (-10.862 to -4.305) with a corresponding p-value of < 0.001 which was statistically significant, which means group K required more rescue dose of propofol compared to DK group

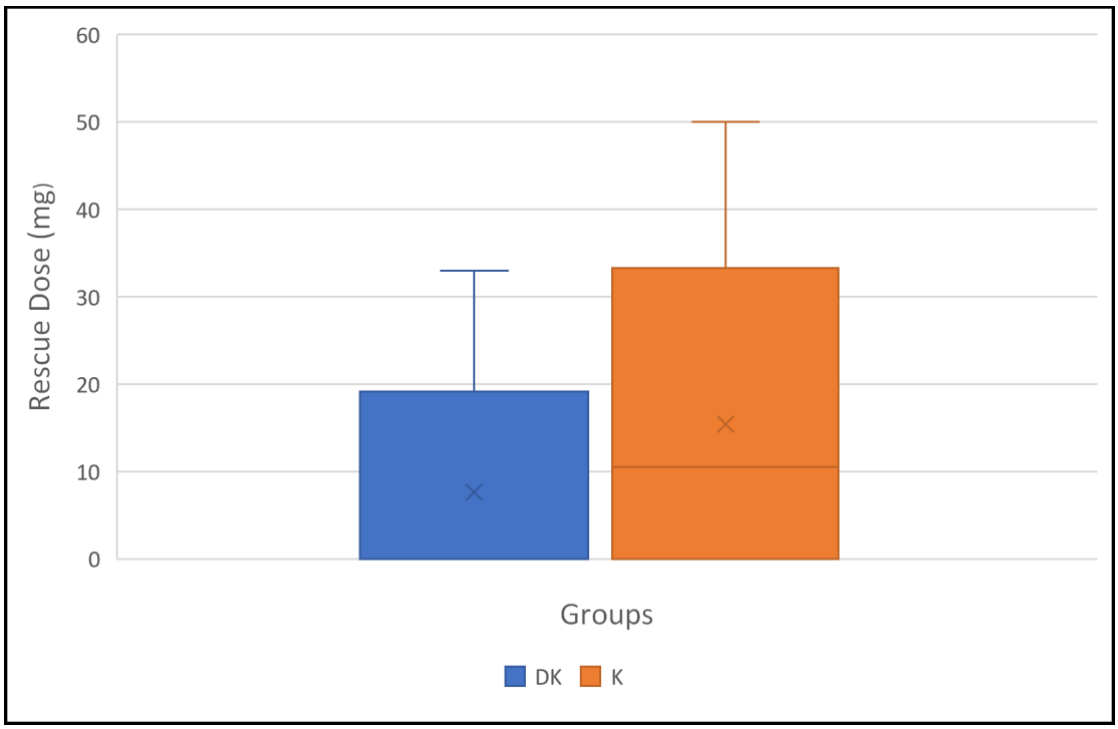


Fig.15: Comparison of rescue dose of propofol requirement in study groups

Table.13: Comparison of maintenance dose of propofol requirement in study groups

Maintenance dose of propofol (mg)	Group DK	Group K	Median difference	95% CI	P-value
Median (IQR) Range	81(60-108) [19.20-172.50]	82.7 (70.25-105.75) [43.20-272.0]	1.75	(-20.6 to5.96)	0.277

The above table shows the comparison of the study group according to the maintenance dose of propofol. The median (IQR)(range) maintenance dose of propofol in Group DK and K was 81(60-108) [19.20-172.50] mg and 82.7(70.25-105.75) [43.20-272.0] mg, respectively. **The Mann Whitney u**-test was used to compare the maintenance dose of propofol between the study groups, which showed a median difference (95% CI) of 1.75 ((-20.6 to5.96) between groups with a correspond-value of 0.277 which was statistically non-significant, which means both the study groups were comparable concerning the maintenance dose of propofol of the patients

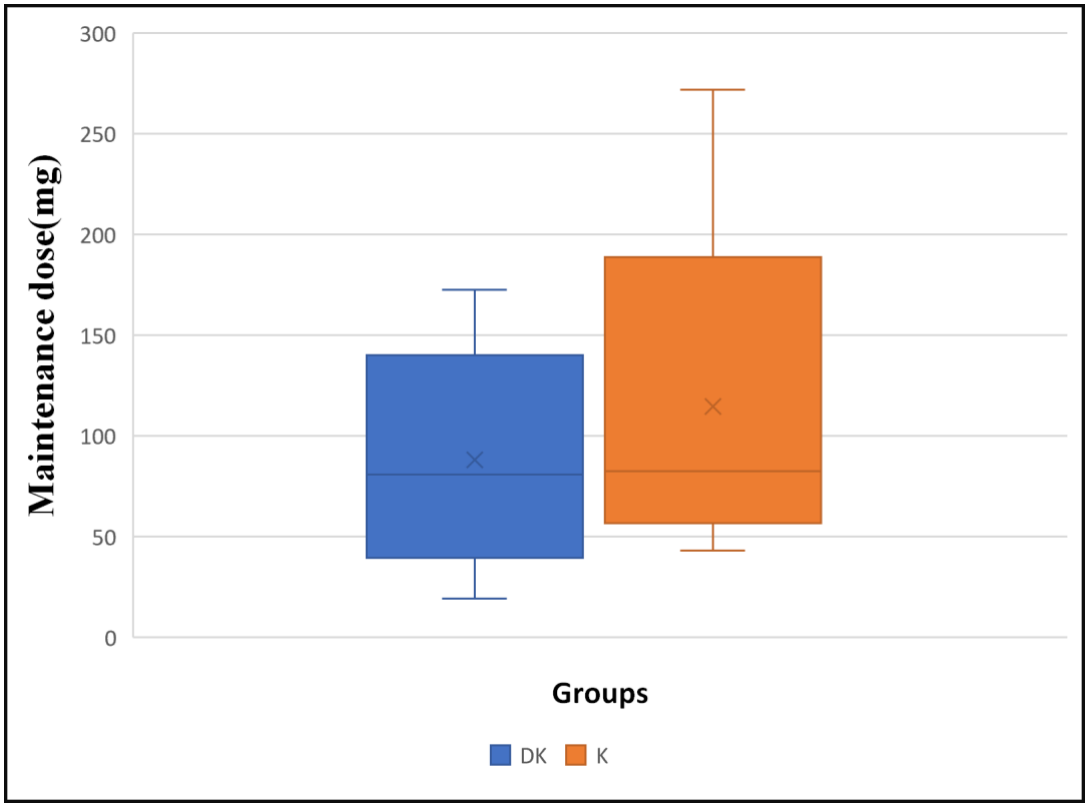


Fig:16 Comparison of maintenance dose of propofol requirement

Table.14: Comparison of total dose requirement of propofol in study groups

Total dose of propofol (mg)	DK	K	Median difference	95% CI	P-value
Median (IQR) Range	84(60-110) [19.2-185]	92.5(75-119.25) [43-321]	13.25	-30.01 to -.168	0.048

The above table shows the comparison of the study group according to the total dose of propofol required during MRI in the study groups. The median (IQR)(range) total dose of propofol in Group DK and K was 84(60-110) [19.2-185] mg and 97.7(75-119.25) [43-321] mg, respectively. **The Mann-Whitney u**-test was used to compare the rescue dose of propofol between the study groups, which showed a median difference (95% CI) of 13.25 (-30.01 to -0.168) with a corresponding p-value of < 0.048 which was statistically significant, which means group K required more dose of propofol compared to DK Group.

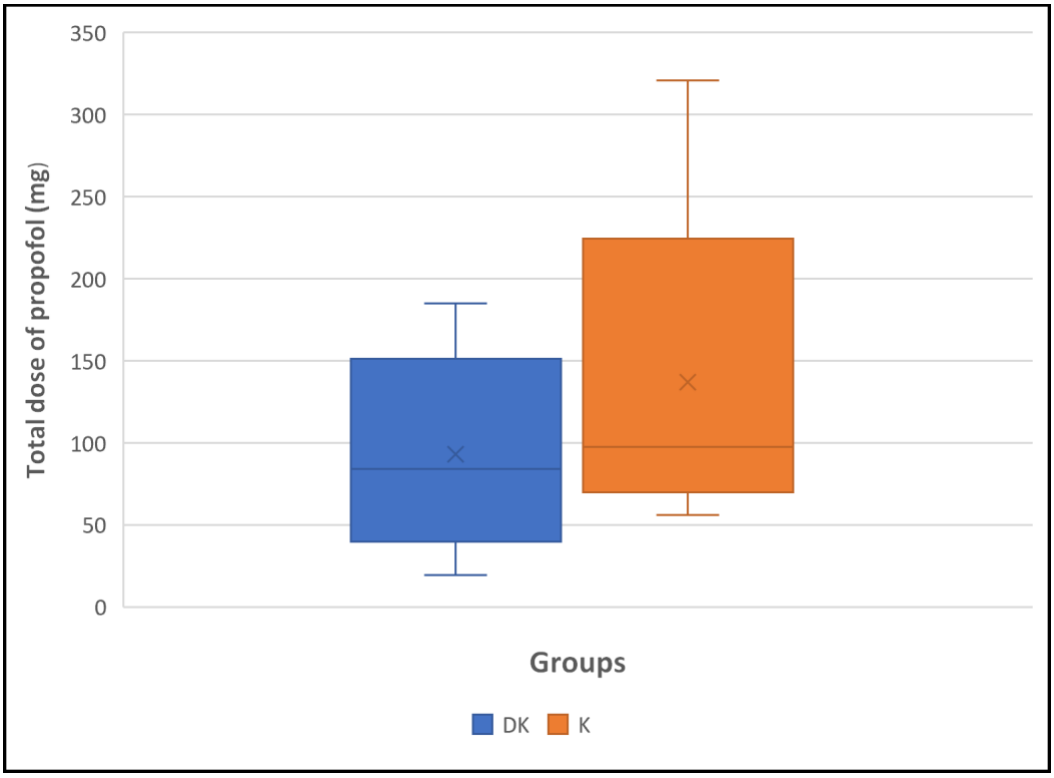


Fig:17. Comparison of total dose requirement of propofol

Table.15: Comparison of total duration of MRI in study groups

Duration of MRI (min)	Group DK	Group K	Median difference	95% CI	P-value
Median(IQR) Range	40(40-45) (35-55)	43(40-45) (35-55)	3	-1.993 to 0.750	0.073

The above table shows the comparison of the study group according to the duration of the MRI. The median (IQR)(range) maintenance dose of propofol in Group DK and K was 40(40-45) (35-55) min and 40(40-45) [35-55] min, respectively. **The Mann Whitney u**-test was used to compare the maintenance dose of propofol between the study groups, which showed a median difference (95% CI) of 3 (-1.993 to 0.750) between groups with a correspond-value of 0.073 which was statistically not significant, which means total duration of MRI was comparable in both group.

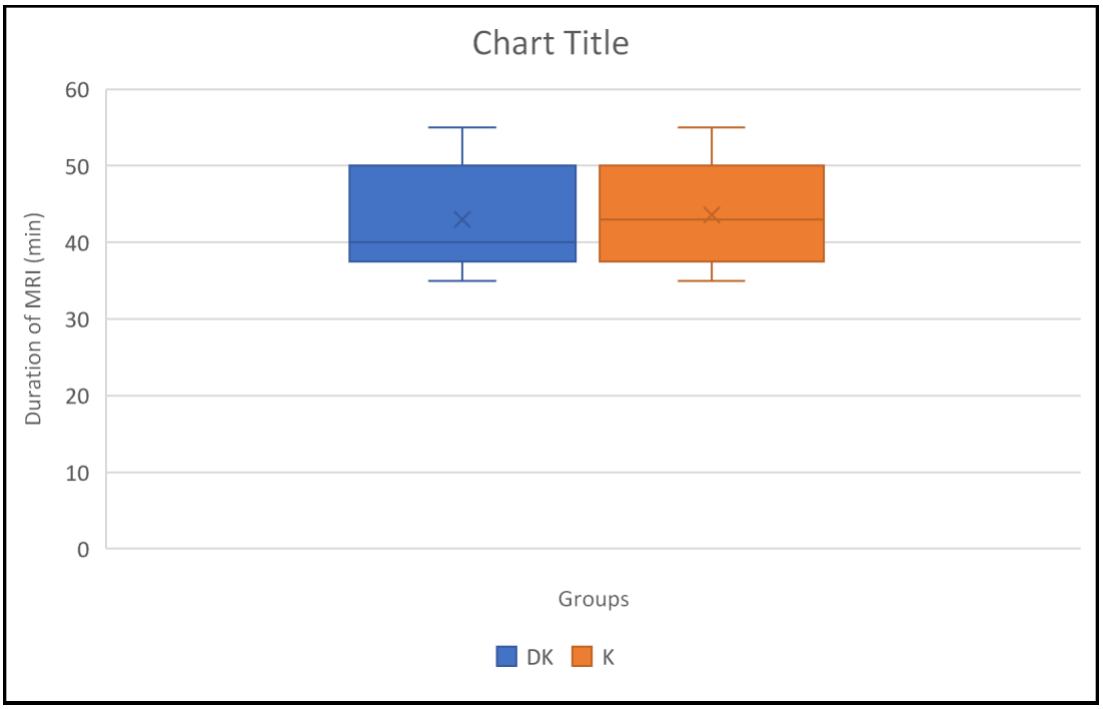


Fig:18 Comparison of total duration of MRI in study groups

Table.16: Comparison of duration of sedation in study groups

Duration of sedation (min)	DK	K	Median difference	95% CI	P-value
Median (IQR) Range	42 (41-46) [36-57]	44(42-46) [36-56]	2	-1.925 to 0.865	0.085

The above table shows the comparison of the study group according to the duration of sedation. The median (IQR)(range) duration of sedation in Group DK and K was 42 (41-46) (36-57) min and 44 (42-46) 36-56] min, respectively. **The Mann Whitney u-**test was used to compare the maintenance dose of propofol between the study groups, which showed a median difference (95% CI) of 2 (-1.925 to 0.865) between groups with a correspond-value of 0.085 which was statistically not significant, which means duration of sedation was comparable group.

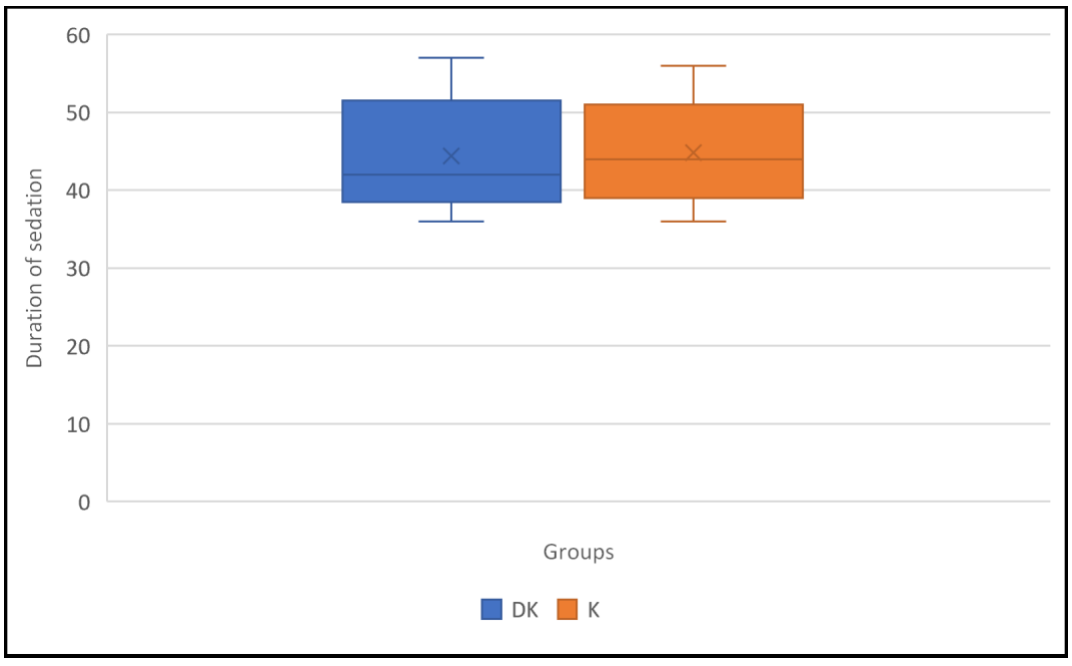


Fig:19. Comparison of duration of sedation in both study groups

Table.17: Comparison of discharge time in study groups

Recovery Time (min)	DK	K	Median difference	95% CI	P-value
Median(IQR) Range	27(24-32) (19-39)	26.5(25-29.5) (22-39)	-0.5	-0.852 to 0.034	0.055

The above table shows the comparison of the study group according to the discharge time. The median (IQR)(range) recovery time in Group DK and K was 27 (24-32) (19-39) min and 26.5(25-29.5) [22-39] min, respectively. The Mann Whitney u-test was used to compare the recovery time between the study groups, which showed a median difference (95% CI) of -0.5 (-0.852 to 0.034) between groups with a correspond-value of 0.055 which was statistically not significant, which means the study groups are comparable in terms of recovery.

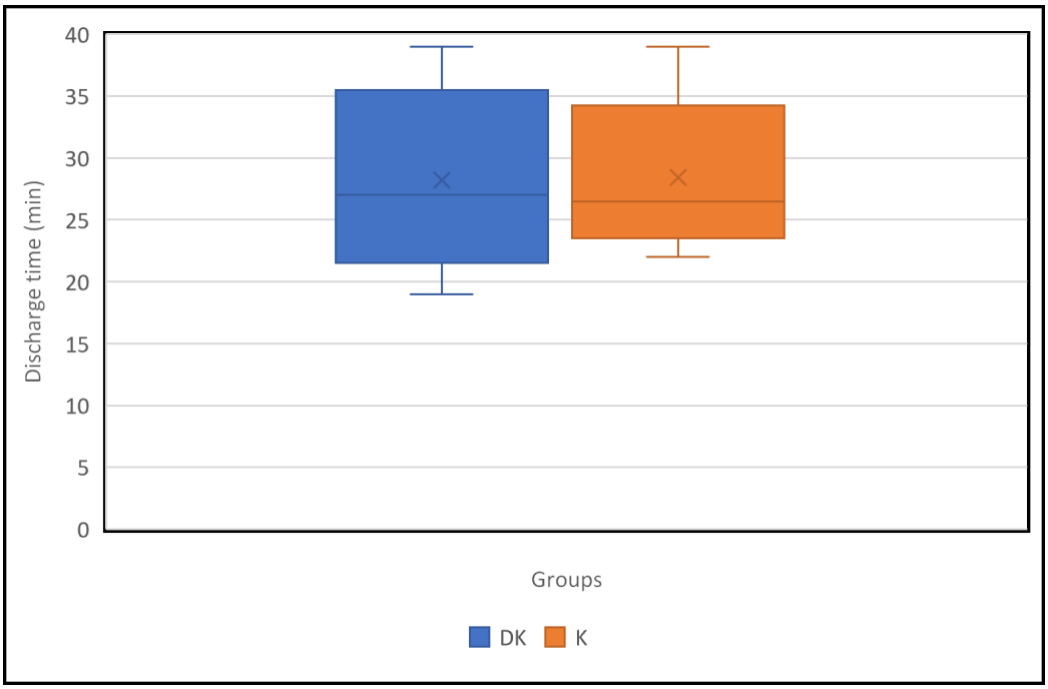


Fig .20: Comparison of discharge time in both study groups

Table 18: Comparison of UMSS score between the groups

Time	DK Group Median (IQR) Range	K Group Median (IQR) Range(min-max)	Median Difference (95% CI)	P value
UMSS BASAL SCORE	0(0-0) (0-0)	0(0-0) (0-0)	00	1.000
UMSS AT PREMED	1(1-1) (0-1)	0(0-0) (0-0)	1(0.68 to 0.88)	0.000
UMSS AFTER INDUCTION	2(2-2) (2-3)	2(2-2) (2-2)	0(-0.01 to 0.04)	0.317
END _OF _IMAGING	1(1-2) (1-2)	1(1-1) (1-1)	0(-0.03 to 0.24)	0.143
UMSS AT THE RECOVERY	1(1-1) (1-2)	1(1-1) (1-1)	0(-0.05 to 0.05)	1.000
UMSS AT 15 MIN AFTER REC	0(0-1) (0-1)	0(0-1) (0-1)	0(0.27 to 0.54)	1.000
UMSS AT 25 MIN AFTER REC	0(0-0.25) (0-1)	0(0-0) (0-0)	0(-0.04 to 0.22)	0.191
UMSS AT 35 MIN AFTER OF REC	0(0-0) (0-0)	0(0-0) (0-0)	00	1.000
UMSS AT 45 MIN AFTER REC	0(0-0) (0-0)	0(0-0) (0-0)	00	1.000
UMSS AT 60 MIN AFTER REC	0(0-0) (0-0)	0(0-0) (0-0)	00	1.000

The above table shows the comparison of the median UMSS between the study groups at different time intervals. The UMSS was measured at Baseline, after premedication, after induction, end of imaging and in recovery area till 60-minute post scan. **The Mann-Whitney u** was used to compare the UMSS at different points of measurement between the study group, which showed that p value was statistically insignificant at all points of measurement. ($p>0.05$) except after administration of premedication where is p value is statistically significant, means administration of dexmed causing decrease UMSS.

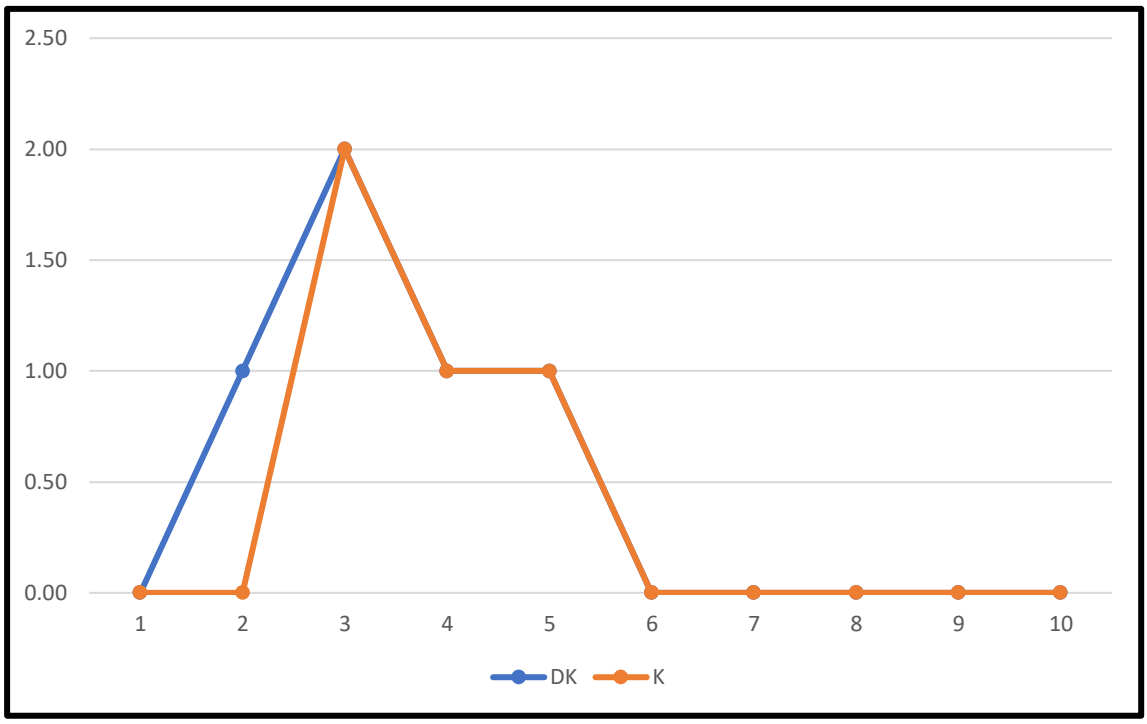


Fig- 21: Comparison of UMSS score between the groups

Table 19: Distribution of patients in different quality of sedation and comparison of median quality of sedation between the groups

Quality of sedation	DK	K	**Median difference(95% CI)**	**P-value**
Excellent	47 (71.2%)	31 (47%)		
Good	14 (21.2%)	24 (36.4%)		
Poor	5 (7.6%)	11 (16.4%)		
Total	66	66		
Median(IQR) Range	1(1-2)(1-3)	2(2-3)(1-3)	1(-0.569 to -0.0969)	0.005

The above table shows the distribution of patients in different quality of sedation categories and compares the median(IQR) quality of sedation between the two groups. The median (IQR)(range) quality of sedation in Group DK and K was 1(1-2) (1-3) and 2 (2-3) [1-3], respectively. **The Mann Whitney U** test was used to compare the quality of scan between the study groups, which showed a median difference (95% CI) of 1 (-0.569 to -0.0969) between groups with a correspond-value of 0.005, which was statistically significant, which means DK group having a better quality of sedation compared to K group.

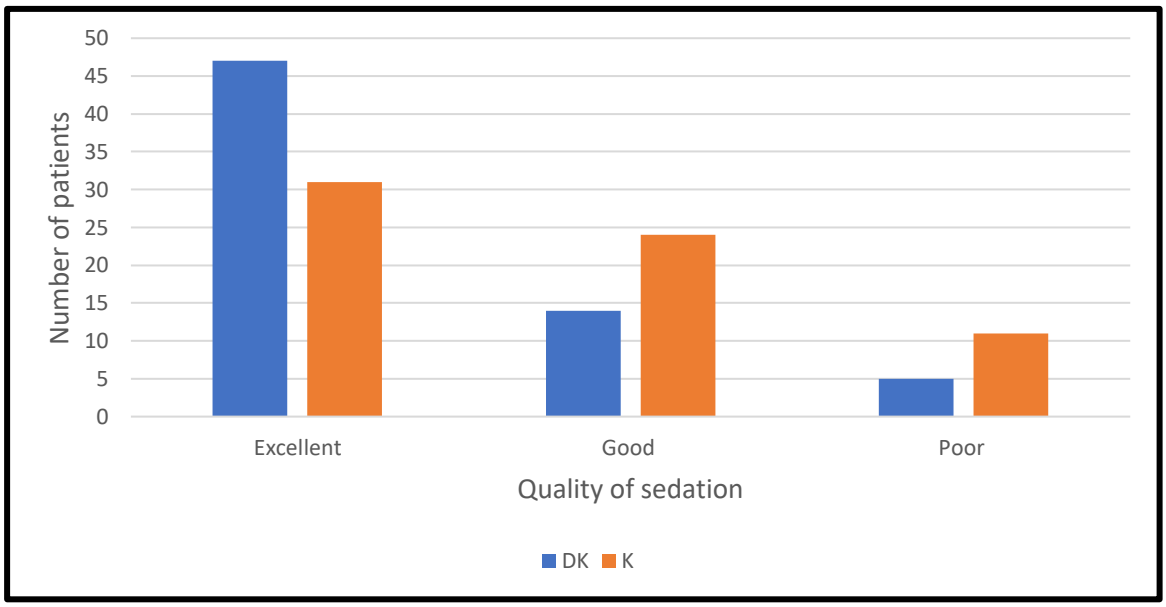


Fig: 22. Distribution of quality of sedation between the groups

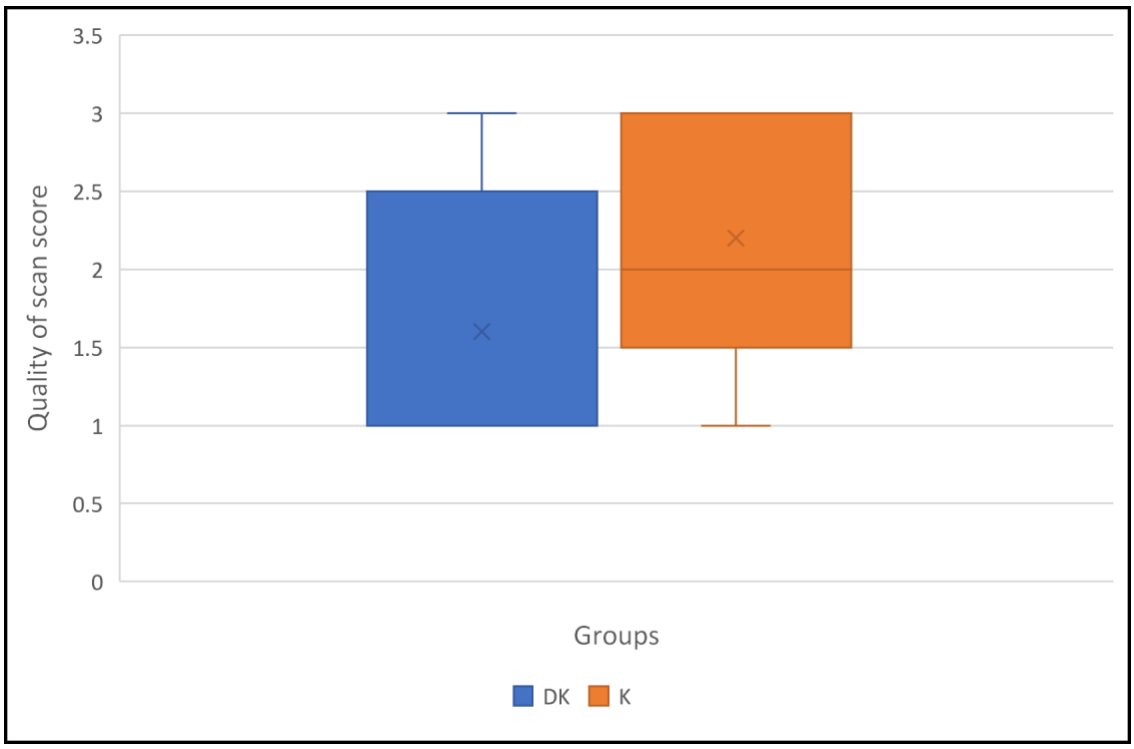


Fig: 23. Comparison of quality of sedation(median) between the groups

Table 20: Distribution of patients in different quality of scan and comparison of median quality of scan between the groups

Quality of scan	DK	K	**Median difference (95% CI)**	**P-value**
Excellent	48 (72.7%)	29 (43.93%)		
Good	13 (19.6%)	22 (33.33%)		
Poor	5 (7.5%)	15 (22.7%)		
Total	66	66		
Median(IQR) Range	1(1-2)(1-3)	2(1-2)(1-3)	1(-0.6849 to -0.1938)	0.001

The above table shows the distribution of patients in different quality scan categories and compares the median(IQR) quality of scans between the two groups. The median (IQR)(range) quality of scan in Group DK and K was 1(1-2) (1-3) and 2 (1-2) [1-3], respectively. **The Mann Whitney u**-test was used to compare the quality of scan between the study groups, which showed a median difference (95% CI) of 1(-0.6849 to -0.1938) between groups with a correspond-value of 0.001, which was statistically significant, which means DK group having a better quality of scan compared to K group.

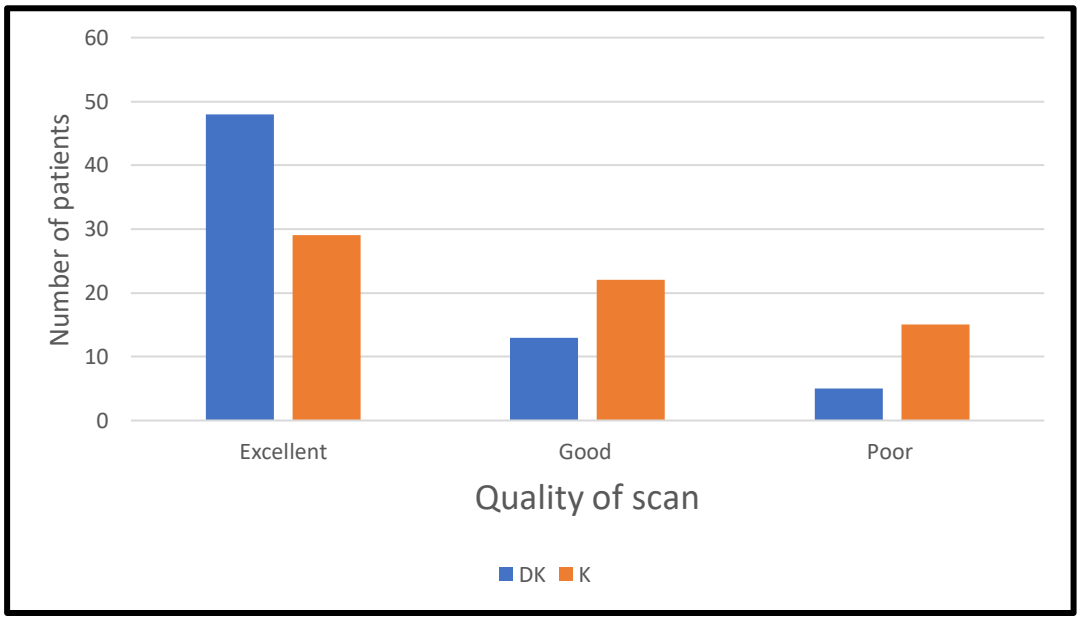


Fig:24. Distribution of Quality of scan between the groups

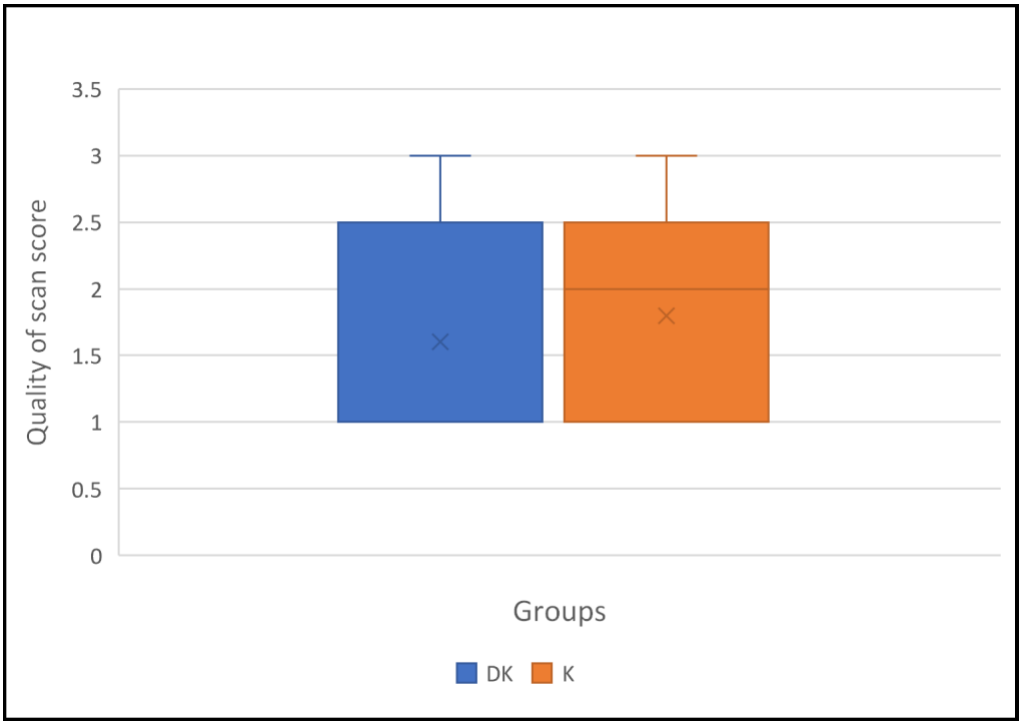


Fig:25. Comparison of median Quality of scan between the groups

DISCUSSION

In the current study, the DK group's sedation quality was significantly improved. In the DK group, 71 % of patients experienced excellent sedation. Dexmedetomidine was added as a premedication, which not only enhanced the quality of the sedation but also the scan quantity, the number of rescue propofol doses needed during the procedure, and the total amount of propofol dose.

A high-quality MRI scan requires a motionless patient because movement is the most common source of artifacts and image distortion. Children are unable to remain still while lying down in MRI suit. As a result, sedation is frequently required to keep them calm and still while the imaging is being done. This is because tiny movements would need repeating the entire procedure, which would ultimately make it take longer. For this apparent reason, deep sedation during MRI is frequently required in paediatric patients. Many medications, including propofol, ketamine, and thiopentone, are frequently used for sedation in MRI rooms independently or in combination.

The present study aimed to compare the effect of the addition of IV dexmedetomidine bolus 10 minutes before ketofol induction in paediatric patients posted for MRI scans. The primary objective was to compare the quality of sedation with and without dexmedetomidine before induction. The secondary objective included comparing the quality of the scan, comparing the amount and number of rescue doses of propofol required for maintenance of sedation, and comparing the total number of rescue doses of propofol required. A total of 150 patients were assessed for eligibility. Out of them, 18 patients were excluded for various reasons. The remaining 132 patients were recruited for randomization and equally distributed to two groups, DK and K.

Demographic profile:

Age:

In our study, the DK and K groups' median (IQR) ages were 36 (12–63) and 24 (12–60), month respectively. With a p-value of 0.394, both groups' ages were comparable.

In study by, " Öznur Uludağ " enrolled individuals who belonged to similar age groups. The study population's mean and standard deviation (SD) ages were 3.1 1.68 and 4.75 3.55 (years), respectively, with a p-value of 0. 68[20]

Jackson TJ et enrolled patients with median ages 33(29-59), 42(26-53), and 40 (23-49) months in different groups undergoing MRI. [24]

Keira P. Mason et al. enrolled patient age with mean ± SD (years) was 3.0 ± 2.2. for MRI sedation [26]

Hongbin Gu et al. also enrolled 156 children aged from 3 months to 6 years for MRI sedation their mean age ± SD in groups A & B was (30.34±15.67) and (27.68±17.51). respectively [27]

Gender:

In our study, the DK group consisted of 46 male and 20 female participants, whereas the K group consisted of 41 male and 25 female patients. In our study, both groups' gender distributions were comparable.

Schmitz et al included 175 males and 156 females, out of which 89 (53%) males and 78 (47%) females were in propofol mono-group while 86 (52 %) males and 78(48%) females in Ketamine-propofol group [19]

Öznur Uludağ et al. included 10(50%) males in both MK and MP groups while 13(65%) and 7 (35%) females in MK & MP group with P-value- 0.337, which is insignificant and results are comparable to our study [20]

Most of the other similar studies reported no significant difference in the gender distribution between their groups

Weight:

In our study, Group DK's median (IQR) weight was 13(8.85-18) kg, whereas Group K's was 13(10.7- 16.2) kg. (p=0.407); both groups were comparable in terms of weight.

Similar to our study, Schmitz's study found that the median (IQR) weight for the propofol mono group was 15.4 (11-21) kg and for the ketamine propofol group it was 16 (12-22) kg. [19]

Weight was 13.8 4.13 kg in the mid-ketamine group and 17.9 8.38 kg in the midaz propofol group in the study by Uluda et al. (mean SD), with a p-value of 0.057, which was a non-significant difference. [20]

In contrast, Jackson et al. used a weight-based (15 kg threshold) in the applied dosing strategy for their study. [24]

Mark a Baily et al. used weight division in three categories with less than 5kg to 15 kg and 15 to 40 kg and found a median weight of 12.4 kg (range 5.1–35.9 kg).[28]

Site of MRI:

The primary imaging sites in our study group were the brain, brain spine, and abdomen-pelvis. The site distribution of MRI in the majority of previous studies of a similar nature published is comparable [19,20]

Duration of MR imaging-

In groups DK and K, the median (IQR) MRI time was 40(40-45) minutes, and it was 43(40-45) minutes, respectively. (P= 0.073) The length of the MRI was comparable for the two groups.

In a study conducted by Schmitz where the median (IQR) duration of MRI scan in the propofol -mono group and ketamine- propofol group was 57 (48-67) and 58 (48-70) min respectively. i.e. there was no significant difference in the duration of MRI of both the groups, and it was similar to our study. [19]

Other similar studies also reported no significant difference in the duration of MRI

Recovery time-

Recovery times in our study were 27 (24-32) and 26.5 (25-29.5) minutes for groups DK & K, respectively. (p=0.978), indicating that the recovery times of the two groups were comparable.

In Nagoshi's study, the recovery times for the propofol and Dex + propofol groups were 28 (17–39) and 27 (18–41), respectively. It was similar to our study in that there was no significant difference in the recovery times of the two groups (p=.694). [29]

The patients in the ketamine-propofol group in Schmitz et al trial.'s had much quicker recovery times (38 (22-65) vs. 54 (37-77) minutes; (P .001), so their findings are not similar to our findings. [19]

In a study by Sethi et al., group C's discharge time was shortest when 50 mcg/kg/min of propofol was used, and group A's discharge time was the longest when 100

mcg/kg/min of propofol was used. statistically and clinically significant difference. These outcomes are not comparable to our outcomes. [16]

Hemodynamic observation*:*

In our study, hemodynamic variables, SBP, DBP, SPO2, and RR have monitored baseline and different intervals were statistically comparable in both groups. This means both groups had stable vitals and didn't show any specific difference. The maintenance of SBP & DBP at all point of time is due to we used ketofol for the induction of sedation. Both ketamine and propofol counteract each other's side effect and maintained stable blood pressure.

In the study conducted by sethi et al statistically significant difference was observed in the SBP at 20, 25, and 30 min between the groups, other hemodynamic including DBP, HR, and SPO2 comparable at various points of time between the groups with no significant variation seen within each group.[16]

In contrast to our result, Mustafa et al. found that groups differ significantly in hemodynamic. The blood pressure and heart rate were highest in the dexmedetomidine-ketamine group, while the hemodynamic condition was least affected by the dexmedetomidine-propofol group [30]

In contrast to our results kamal et al observed the mean HR was found to be lower in Group D as compared to Group P, the difference being significant up to 25 min interval ($P < 0.05$). The mean SBP was found to decrease in both the groups from the baseline, the difference being highly significant up to 35 min in Group D and up to 30 min in Group P.[31]

Koroglu *et al*., who found a highly significant decrease in HR from the baseline during sedation with dexmedetomidine as well as propofol ($P < 0.001$).[32]

Sedation score

In our study, UMSS was used to assess the sedation level between the two groups. UMSS scoring was assessed at different time intervals. All patients in both groups achieved UMSS score of 2 before starting the scan. Children in the DK group achieved a score 1 just after premedication. It was because of the administration of dexmedetomidine cause sedation

Primary outcome

Quality of sedation-

Our study uses the patient's movements and the need for rescue propofol during MRI imaging to assess the level of sedation. There are three categories of sedation quality: excellent, good, and poor. With a p-value of.005, the percentages of patients in the DK and K groups who qualified as excellent, good, or poorly sedated were 47/14/5 and 31/24/11, respectively. DK group experienced much higher sedation quality and less movement throughout the surgery.

Sedation quality was evaluated in a study by Schmitz et al. by MRI and anaesthesia professionals. Less mobility during the scan indicated higher sedative quality in the propofol-mono group compared to the ketamine-propofol group. 10.2% and 25.6%, respectively, of the propofol group and the ketamine-propofol group experienced moderate to severe movement. They discovered p =.001 and 95% CI = 2.52. (1.50 to 4.23) [19]

Secondary outcome-

Quality of scan:

In our investigation, the scan quality is determined by motion artefacts that occur throughout the scan and whether any sequences need to be repeated. Three levels of sedative quality were identified: excellent, good, and poor. With a p-value of.005, the percentages of patients in the DK and K groups who qualified as excellent, good, or poorly sedated were 48/13/5 and 29/22/15, respectively. Dexmedetomidine was used as a premedication to improve the sedation, which reduced movement and improved scan quality.

The effectiveness of sedation is evaluated by Koroglu et al. using a three-point scale (1-no motion; 2 - minor movement; 3-major movement necessitating another scan). They studied 40 kids and discovered that 63% of dexmedetomidine- and 66% of propofol-treated kids got excellent scans. [32] The probable reason of their equal quality of scan in both group would be that doses of dexmedetomidine was 1 mcg/kg/min followed by 0.5mcg/k/h whole duration of the scan in group D, while in group P they use 3mg/kg dose of propofol for induction, followed by 100mcg/kg/min. drug doses used in both group was significantly higher than we used in our study**.**

Kamal et al investigation 's likewise produced similar scan quality results. [31]

Schmitz et al findings' are in contrast to our own in that although there was a slight improvement in picture quality between the propofol mono group and the ketamine propofol group, this difference was not statistically significant. [19]

Additionally, Sethi et al. discovered that the three study groups' scan quality was statistically equal. [16] The majority of these investigations found no discernible

variation in scan quality across study groups. Reason of is this that they gave midazolam 0.05 mg/kg i.v. to the child 30 min before the scan and the induction dose of propofol and ketamine used for sedation was higher then what we used**.**

Our findings are not comparable to those of other research, however, we find that the DK group had much higher scan quality.

Additional sedation propofol boluses

In our study we measure additional bolus doses of propofol (0.5mg/kg) if the child starts moving or there is inadequate sedation during the scan. The proportion of patients who required additional propofol boluses 0/1/2/3/4 in group DK & K was 47/11/3/5/00 and 23/5/20/16/2 respectively. We find a statically significant difference between the group (p=.001)

Kamal et al used an increased infusion rate in place of additional bolus doses. They observed that 30% of patients in group D required an increased infusion rate of the study drug compared to 16% in group P (P 0.05).[31]

Total propofol used

The total propofol used during the procedure was the sum of the maintenance dose and additional bolus doses of propofol. The median (IQR) total dose of propofol in Group DK and K was 84(60-110) [19.2-185] mg and 97.7(75-119.25) mg, respectively. Group K required significantly more propofol. (p=0.048). The addition of dexmedetomidine significantly reduced propofol requirement.

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Nagoshi at el found that the requirement of total propofol was significantly higher in group P compared to D + P group; 215.0 (182.6-253.8) vs 147.6 (127.5-180.9); Median Diff = -67.8; 95%CI = -80.6, -54.9; P < .0001. These results are comparable to our study. [14]

In the study conducted by Schmitz et al median propofol requirement in propofol mono group and Ketamine-propofol-group was 165 (119-238) and 90 (69-135) respectively with p-value <.001, there was significant difference between the total propofol used by both the groups and it was comparable to our study [19]

Study Strength

1. Our study was double-blinded study, Parents and anaesthesiologist fellows involved in patient's recruitment, sedation, and data collection were remain blinded making our results more validated
2. Utilizing limited observer for evaluating the result measures and preventing inter-individual variation
3. During scanning data were collected every 5 minutes' f to increase the reliability of picking all the patients who developed any significant adverse event.

Limitation of study

1. It was single-center study
2. For assessment of the quality of sedation and scan no validated score was used. we use a subjective scale
3. We include only ASA I/II patients only,

CONCLUSION

According to our study, groups DK & K experienced great quality sedation at rates of 71% and 47%, respectively. The quality of sedation and the quality of the MRI scan are greatly improved by administering dexmedetomidine (0.5 mcg/kg) 10 minutes before to induction. The significant advantage of this technique is decreased need for additional propofol dose and better hemodynamic stability without delaying recovery time

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अखिल भारतीय आयुर्विज्ञान संस्थान, जोधपुर
All India Institute of Medical Sciences, Jodhpur
संस्थागत नैतिकता समिति
Institutional Ethics Committee

No. AIIMS/IEC/2021/3495 Date: 12/03/2021

ETHICAL CLEARANCE CERTIFICATE

Certificate Reference Number: **AIIMS/IEC/2021/3330**

Project title: **"Comparison of effect of dexmedetomidine with ketofol and ketofol alone on quality of sedation in paediatric patient undergoing magnetic resonance imaging (MRI) : A prospective randomized controlled double blind trial."**

Nature of Project:	**Research Project Submitted for Expedited Review**
Submitted as:	**M.D. Dissertation**
Student Name:	**Dr. Reena Chakravarty**
Guide:	**Dr. Rakesh Kumar**
Co-Guide:	**Dr. Pradeep Bhatia, Dr. Swati Chhabra, Dr. Manoj Kamal & Dr. Sadik Mohammed**

Institutional Ethics Committee after thorough consideration accorded its approval on above project.

The investigator may therefore commence the research from the date of this certificate, using the reference number indicated above.

Please note that the AIIMS IEC must be informed immediately of:

- Any material change in the conditions or undertakings mentioned in the document.
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research.
- In case of any issue related to compensation, the responsibility lies with the Investigator and Co-Investigators.

The Principal Investigator must report to the AIIMS IEC in the prescribed format, where applicable, bi-annually, and at the end of the project, in respect of ethical compliance.

AIIMS IEC retains the right to withdraw or amend this if:

- Any unethical principle or practices are revealed or suspected
- Relevant information has been withheld or misrepresented

AIIMS IEC shall have an access to any information or data at any time during the course or after completion of the project. Please Note that this approval will be rectified whenever it is possible to hold a meeting in person of the Institutional Ethics Committee. It is possible that the PI may be asked to give more clarifications or the Institutional Ethics Committee may withhold the project. The Institutional Ethics Committee is adopting this procedure due to COVID-19 (Corona Virus) situation. If the Institutional Ethics Committee does not get back to you, this means your project has been cleared by the IEC.

On behalf of Ethics Committee, I wish you success in your research.

Dr. Praveen Sharma
Member Secretary

Member secretary
Institutional Ethics Committee
AIIMS,Jodhpur

Basni Phase-2, Jodhpur, Rajasthan-342005; **Website:** www.aiimsjodhpur.edu.in; **Phone:** 0291-2740741 Extn. 3109
E-mail : ethicscommittee@aiimsjodhpur.edu.in; ethicscommitteeaiimsjdh@gmail.com

ETHICAL JUSTIFICATION

- Informed written consent will be taken as per the attached proforma from all the study subjects.
- No pressure or coercion will be exerted on subjects for participation in study.
- Enrolment in the study will not pose any additional risk to the patient and will not increase the cost of the treatment.
- Confidentiality and privacy will be maintained at all stages.

PROFORMA

PATIENT ID AGE

WEIGHT SEX

SITE OF IMAGING

PAC - HR SpO2 BP

Induction
Inj Ketofol (1:1) of 0.5 mg/ kg

Maintenance
Infusion of Propofol @ 100mcg/kg/min

	Baseline	1min	5min	10min	15min	20min	25min	30min	40min	50min	60min
HR											
NIBP											
SPO2											
RR											

	Baseline	After premed	After induction	End of imaging	Recovery 5min	15min	25min	35min	45min	60min
UMSS										

Rescue dose (Propofol 0.5mg/kg) required- YES/NO

No. Of rescue doses-

Duration of imaging -

Duration of sedation

Recovery time

Movement (No, mild, moderate & severe)

Quality of Scan (excellent/good/poor)

Adverse effect-

All India Institute of Medical sciences, Jodhpur, Rajasthan.

Informed Consent Form

Title of the project: COMPARISON EFFECT OF DEXMEDETOMIDINE WITH KETOFOL AND KETOFOL ALONE ON QUALITY OF SEDATION IN PAEDIATRIC PATIENTS UNDERGOING MAGNETIC RESONANCE IMAGING(: A PROSPECTIVE RANDOMISED CONTROLLED DOUBLE BLIND TRIAL.

Name of the Principal Investigator : Dr Reena Chakravarty Tel. No.7722939442 Patient/Volunteer Identification No. : _____

I, _____ S/o or D/o _____ R/o _____ give my full, free, voluntary consent to be a part of the study "_____ _____", the procedure and nature of which has been explained to me in my own language to my full satisfaction. I confirm that I have had the opportunity to ask questions.

I understand that my participation is voluntary and am aware of my right to opt out of the study at any time without giving any reason.

I understand that the information collected about me and any of my medical records may be looked at by responsible individual from _____ (Company Name) or from regulatory authorities. I give permission for these individuals to have access to my records.

Date: _____ _____

Place: _____ Signature/Left thumb impression

This to certify that the above consent has been obtained in my presence.

Date: _____ _____

Place: _____ Signature of Principal Investigator

Witness 1 Witness 2

_____ _____

Signature Signature

Name: _____ Name: _____

Address: _____ Address: _____

अखिल भारतीय आयुर्विज्ञान संस्थान, जोधपुर, राजस्थान।

सूचित सहमति प्रपत्र

परियोजना का शीर्षक: : पेडियोट्रिफ़िक मरीजों के शरीर में छंटनी और कीटोफ़ोल की मात्रा के साथ डायक्समेडिटाइन का अलग-अलग मात्रात्मक प्रतिरक्षा संयोजन इमेजिंग: (एक प्रोप्रायडिव रैंडमाइज्ड नियंत्रित डब्लूडब्लूई ट्राइबल)।

प्रधान अन्वेषक का नाम: डीआर रीना चक्रवर्ती तेल। सं .7722939442 रोगी / स्वयंसेवक पहचान संख्या: _____

I, _____ S / o या D / o _____

R / o _____

मेरी पूर्ण, मुक्त, स्वैच्छिक सहमति को अध्ययन का एक हिस्सा बनने के लिए "_____ _____", प्रक्रिया और प्रकृति जिसकी मुझे अपनी भाषा में समझाया गया है। मेरी पूरी संतुष्टि के लिए। मैं पुष्टि करता हूं कि मुझे सवाल पूछने का अवसर मिला है।

मैं समझता हूं कि मेरी भागीदारी स्वैच्छिक है और बिना किसी कारण के किसी भी समय अध्ययन से बाहर निकलने के मेरे अधिकार से अवगत हूं।

मैं समझता हूं कि मेरे और मेरे किसी भी मेडिकल रिकॉर्ड के बारे में एकत्रित जानकारी को

_____ (कंपनी नाम) के जिम्मेदार व्यक्ति या नियामक अधिकारियों से देखा जा सकता है। मैं इन व्यक्तियों को अपने रिकॉर्ड तक पहुंचने की अनुमति देता हूं।

दिनांक: _____ _____

जगह: _____ हस्ताक्षर / बाएं अंगूठे का निशान

यह प्रमाणित करने के लिए कि मेरी उपस्थिति में उपरोक्त सहमति प्राप्त की गई है।

दिनांक: _____ _____

स्थान: _____ प्रमुख अन्वेषक के हस्ताक्षर

साक्षी 1 गवाह 2

_____ _____

हस्ताक्षर हस्ताक्षर

नाम: _____ पता: _____

नाम: _____ पता: _____

PATIENT INFORMATION SHEET

1. Risks to the patients: No interventions or life-threatening procedure will be done.
2. Confidentiality: Your participation will be kept confidential. Your medical records will be treated with confidentiality and will be revealed only to doctors/ scientists involved in this study. The results of this study may be published in a scientific journal, but you will not be identified by name.
3. Provision of free treatment for research related injury. Not applicable.
4. Compensation of subjects for disability or death resulting from such injury: Not Applicable
5. Freedom of individual to participate and to withdraw from research at any time without penalty or loss of benefits to which the subject would otherwise be entitled.
6. You have complete freedom to participate and to withdraw from research at any time without penalty or loss of benefits to which you would otherwise be entitled.
7. Your participation in the study is optional and voluntary.
8. The copy of the results of the investigations performed will be provided to you for your record.
9. You can withdraw from the project at any time, and this will not affect your subsequent medical treatment or relationship with the treating physician.
10. Any additional expense for the project, other than your regular expenses, will not be charged from you.

रोगी सूचना पत्र

1. रोगियों को जोखिम: कोई हस्तक्षेप या जीवन-धमकी की प्रक्रिया नहीं की जाएगी।

2. गोपनीयता: आपकी भागीदारी को गोपनीय रखा जाएगा। आपके मेडिकल रिकॉर्ड को गोपनीयता के साथ माना जाएगा और इस अध्ययन में शामिल डॉक्टरों / वैज्ञानिकों के लिए ही पता चलेगा। इस अध्ययन के परिणाम एक वैज्ञानिक पत्रिका में प्रकाशित हो सकते हैं, लेकिन आपको नाम से नहीं पहचाना जाएगा।

3. अनुसंधान से संबंधित चोट के लिए मुफ्त उपचार का प्रावधान। लागू नहीं।

4. ऐसी चोट के परिणामस्वरूप विकलांगता या मृत्यु के लिए विषयों का मुआवजा: लागू नहीं

5. भाग लेने या लाभ के नुकसान के बिना किसी भी समय अनुसंधान से पीछे हटने की स्वतंत्रता, जिस पर विषय अन्यथा हकदार होगा।

6. आपको किसी भी समय दंड या लाभ के नुकसान के बिना भाग लेने और अनुसंधान से पीछे हटने की पूरी स्वतंत्रता है, जिसके आप अन्यथा हकदार होंगे।

7. अध्ययन में आपकी भागीदारी वैकल्पिक और स्वैच्छिक है।

8. आपके द्वारा रिकॉर्ड की गई जांच के परिणामों की प्रतिलिपि आपको प्रदान की जाएगी।

9. आप किसी भी समय परियोजना से हट सकते हैं, और यह आपके बाद के चिकित्सा उपचार या उपचार चिकित्सक के साथ संबंध को प्रभावित नहीं करेगा।

10. परियोजना के लिए कोई अतिरिक्त खर्च, आपके नियमित खर्च के अलावा, आपसे कोई शुल्क नहीं लिया जाएगा।