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RESEARCH ARTICLE
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EFFECT OF AN EYE MASK ON MIDAZOLAM REQUIREMENT FOR SEDATION DURING SPINAL ANAESTHESIA

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Abstract

Background : Anxiety during spinal anesthesia can exacerbate hemodynamic instability. Midazolam is commonly used for sedation, but external factors like bright lights and a busy operating environment may increase patient discomfort and sedative requirements. This study evaluates whether the use of an eye mask can reduce midazolam requirements during spinal anesthesia.

Study Population:Adult age group between 18 year to 80 years divide randomly among two group ,one masked group and other unmasked group.

Aims: To assess the effect of eye mask use on midazolam requirements and sedation quality during spinal anesthesia.

Methods: After intrathecal injection of 10–14 mg of 0.5% hyperbaric bupivacaine, patients were positioned supine. Sensory block was confirmed at 20 minutes. Sedation was assessed using the Modified Observer's Assessment of Alertness/Sedation (MOAA/S) scale after administering 1 mg IV midazolam every 5 minutes until a score of 3 was reached or up to 35 minutes. Total dose and time to reach MOAA/S score 3 were recorded

Result: The finding was the significantly lower mean midazolam requirement in the masked group (2.06 ± 0.55 mg) compared to the unmasked group (3.14 ± 0.59 mg), with a highly significant p-value (<
0.001).Sedation onset time was notably shorter in the masked group (9.1 ± 2.98 min) compared to the unmasked group (13.3 ± 3.53 min), again statistically significant ($p < 0.001$).

Conclusion:By masking the external factors the requirement of midazolam shows significant decrease in spinal anaesthesia block compare to those without face mask.

Keywords: Midazolam, Eye mask Sedation, Spinal anaesthesia

INTRODUCTION

Regional block is a technique in which a local anaesthetic is injected in proximity to nerves or nerve bundles to reversibly block sensory and often motor signals from a defined region of the body. By interrupting nerve conduction, it provides targeted loss of sensation with an option to preserve consciousness and minimise systemic drug effects [1] Major techniques included in regional anaesthesia include a) neuraxial blocks, including spinal anaesthesia, anaesthesia and

combined spinal epidural [2] ; b)peripheral nerve blocks , including blocks of the upper limb, inter-scalene, supraclavicular, infraclavicular, and axillary plexus, blocks of the lower limb, including the femoral, fascial, adductor canal blocks and truncal and fascial plane blocks; and c) ultrasound guidance, which improves accuracy, reduces anaesthetic volumes, and lowers complication rates (vascular puncture, pneumothorax) [4]. During regional anaesthesia, patients often become anxious, which can aggravate haemodynamic instability. Intravenous sedatives are commonly administered to relieve anxiety and induce hypnosis, thereby increasing patient comfort during surgery [5]. Despite this, some environmental elements in the operating room, including noise made by medical staff and surgical instruments, bright lights, and an unfamiliar environment, can interfere with relaxation, increase anxiety, and necessitate higher sedative doses, increasing the risk of adverse drug effects. Our study was designed to determine whether an eye mask has any effect on the requirements of midazolam for sedation during spinal anaesthesia.The use of midazolam effectively provides procedural sedation, hypnosis, anxiolysis and ante-grade amnesia. Midazolam is a water soluble benzodiazepine class of drugs that act on GABA-A receptors, increasing chloride conductance and leading to hyperpolarisation of the postsynaptic membrane, which makes the nerve less likely to produce action potentials, which have an inhibitory action that leads to sedation and anxiolysis. Midazolam causes a decrease in muscle tone and the ability of carbon dioxide to stimulate breathing, resulting in dose -dependent respiratory depression, especially after the initial dose. Subarachnoid blocks are known to decrease the midazolam requirements due to reduced afferent input, therefore lowering hypnotic demand. Reducing the dose can mitigate the side effects of midazolam, such as hiccups, respiratory depression, cough and vomiting. One nonpharmacological strategy to reduce the dose of midazolam, therefore reducing the requirements of midazolam, is the use of eye masks. Eye masks are simple, noninvasive, cost-effective tools that reduce visual sensory input, which is a dominant contributor to perception and emotional response. One such potential adjunct is sensory deprivation, which is the deliberate reduction or removal of sensory stimuli from one or more of the senses. By blocking visual input, the eye mask reduces the sensory load on the central nervous system, which may lead to a state of relaxation and facilitate lower sedative requirements. By blocking exposure to surgical preparation, bright lights, and staff movement, eye masks decrease anxiety. This sensory deprivation down regulates cortisol and other stress hormones, facilitating parasympathetic dominance and leading to relaxation, and lower sedative demand–sensory deprivation affects the brainstem's reticular activating system (RAS), a network of neurons that is essential for controlling alertness, arousal, and the sleep–wake cycle. Visual stimuli are processed via the retina, which sends information to the visual cortex via the thalamic lateral geniculate nucleus (LGN). Moreover, visual input indirectly influences the RAS. In the absence of light and visual cues, the brain receives fewer excitatory signals, promoting a shift toward parasympathetic dominance and a more relaxed state. Additionally, sensory deprivation can modulate the activity of the limbic system, particularly the amygdala and hippocampus, which are central to processing emotions, memory, and anxiety. Reduced sensory input can dampen emotional arousal, thus lowering anxiety and the perceived need for pharmacological sedation. Eye masks also improve sleep quality before surgery, which reduces preoperative anxiety and sedation requirements.

Aim and Objectives

The aim of this study was to compare how an eye mask affects the amount of midazolam needed for sedation during spinal anaesthesia.The following parameters were compared between the two groups:

1. Dose of midazolam required to reach a MOAA/S score of 3 between the masked group and the unmasked group.
2. Time to achieve a response between the two groups
3. Satisfaction after sedation.

METHODOLOGY

This prospective observational study was conducted at the Sher-e-Kashmir Institute of Medical Sciences, Srinagar, from 2023--2025. After IEC (institutional ethical committee) clearance and consent were obtained from the patients, the study started. A total of 100 patients of both sexes aged 18–80 years were selected. The studies were divided into two groups: group A (50 patients) and group B (50 patients). The inclusion criterion was an ASA of 1 or 2, and patients who planned for elective surgeries and who were receiving spinal anaesthesia were excluded from the study were those with an ASA of 3 or 4; patients with intellectual disability, sleep disorders and contraindications to spinal anaesthesia; pregnant patients; and those who refused to wear eye masks. All the patients were routinely investigated, and a fasting protocol according to ASA guidelines was used. Patients were secured to the operation theatre and IV line, and fluids were administered per the Holliday-Segar formula. Monitoring included ECG, pulse oximetry, and NIBP. Under aseptic precautions with a 25G Quincke spinal needle, while the patient was sitting down, spinal anaesthesia was given in the L3–L4 or L4–L5 interspace via the median or paramedian technique. After receiving an intrathecal injection of 10–14 mg of 0.5% hyperbaric bupivacaine, patients were placed in a supine position. The sensory block level was assessed via the cold test and pin-prick method at 20 minutes post-injection. After block establishment, patients were given the option to wear an eye mask. The Modified Observer's Assessment of Alertness/Sedation (MOAA/S) scale was used to measure sedation after midazolam (1 mg IV) was given every five minutes; 5 = Responds readily to name spoken in normal tone. 4 = Lethargic response to name spoken in normal tone. 3 = Responds only after name is called loudly/repeatedly. 2 = Responds only after mild prodding or shaking. 1 = Responds only to the painful trapezius squeeze. 0 = No response after painful trapezius squeezing. Only scores of 3, 4, and 5 were used. A MOAA/S score of 3 was defined as "sufficient sedation," whereas MOAA/S scores of 4 and 5 indicated "insufficient sedation." In the latter, an extra 1 mg dose of midazolam was given every 5 minutes for up to 35 minutes. The time and total dose needed to achieve a MOAA/S score of 3 were recorded. Vital signs were monitored continuously. Baseline values were considered at the time of midazolam administration (20 minutes postbupivacaine injection). All patients were moved to the recovery room following surgery.

Sedation satisfaction was assessed after 30 minutes via a 4-point Likert scale: 3 = very good, 2 = good, 1 = not bad, 0 = bad

STATISTICAL ANALYSIS

The collected data were organised and entered into a Microsoft Excel spreadsheet and then transferred to the data editor of SPSS Version 29.0 (SPSS , Inc., Chicago, Illinois, USA) and R software for analysis. Frequencies and percentages were used to describe categorical variables, whereas the mean±SD was used to show continuous information. The visual representations included bar graphs and pie charts. Depending on the appropriateness, either the Mann–Whitney U test or Student's independent t test was used for assessments of continuous variables. Fisher's exact test or the chi-square test was applied as necessary for categorical variables. P values less than 0.05 were regarded as statistically significant.

RESULTS AND OBSERVATION

. The results of the study conducted on 100 patients are presented here.

Table 1: Age distribution of study group			
Age group (in years)	**Masked**	**Unmasked**	
<30	14 (28%)	11 (22%)	P value=0.978
31-40	10 (20%)	9 (18%)	
41-50	6 (12%)	7 (14%)	
51-60	11 (22%)	12 (24%)	
61-70	7 (14%)	9 (18%)	
71-80	2 (4%)	2 (4%)	
Total	50 (100%)	50 (100%)	
Mean ± SD	**44.7±17.4**	**46.7±16.3**	

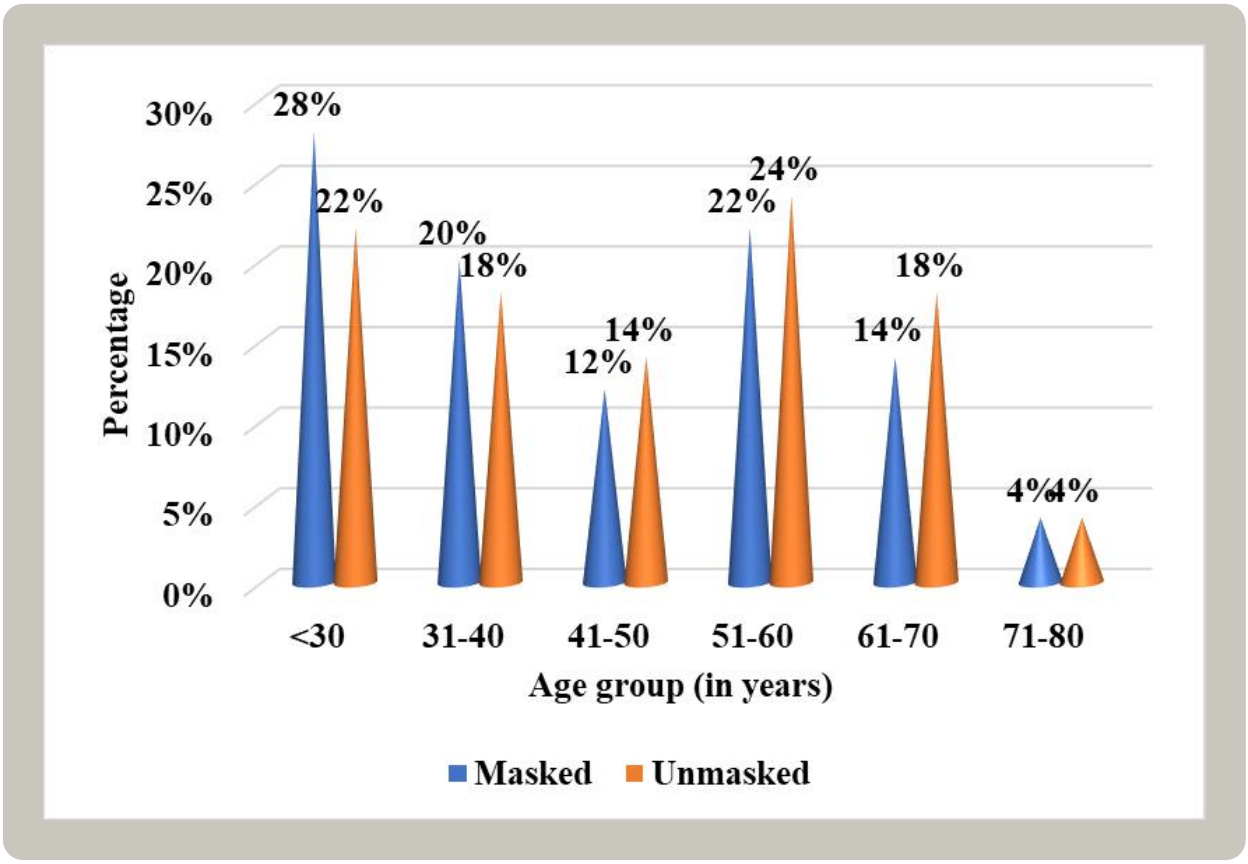

Figure 1: Age distribution of the study group

Table 1 shows the age distribution of the participants in the study group. The age of the patients ranged from <30 years to 71–80 years, with a mean age of 44.7 ± 17.4 years in the masked group and 46.7 ± 16.3 years in the unmasked group. The largest proportion of patients in the masked group (28%) were in the <30 years category, followed by 22% in the 51–60 years category. In the unmasked group, the largest proportion is in the 51–60 years category (24%), followed by <30 years (22%). The lowest representation in both groups is in the 71–80 years category (4%), indicating that the study population

is relatively middle-aged. The p value of 0.978 suggests that there was no statistically significant difference in age distribution between the two groups.

Table 2: Gender distribution of study group			
Gender	**Masked**	**Unmasked**	P value=0.680
Male	30 (60%)	32 (64%)	
Female	20 (40%)	18 (36%)	
Total	**50 (100%)**	**50 (100%)**	
Male: Female	**1.5:1**	**1.8:1**	

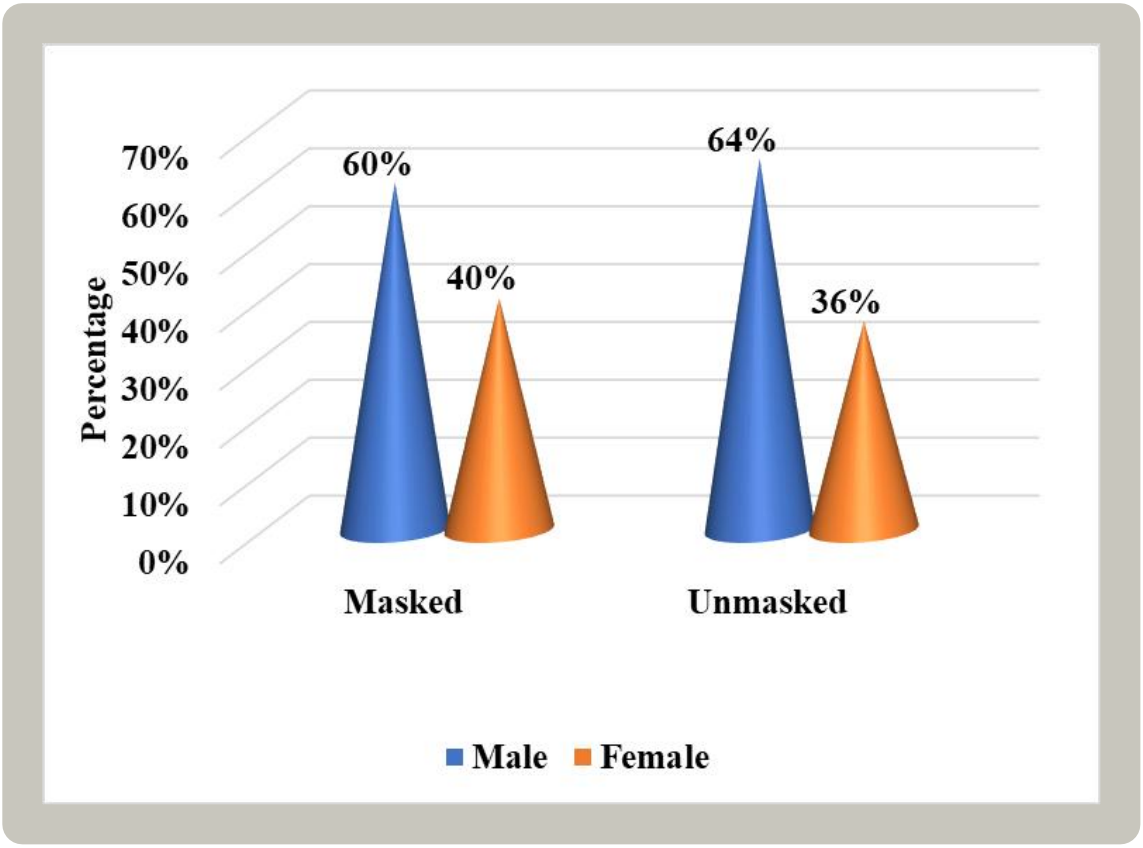

Figure 2: Gender distribution of the study group

Table 2 shows the sex distribution of the study group. In the masked group, 60% of the patients were male, and 40% were female, resulting in a male-to-female ratio of 1.5:1. In the unmasked group, 64% of the patients were male, and 36% were female, with a male-to-female ratio of 1.8:1. The p value of 0.680 indicates no statistically significant difference in sex distribution between the groups.

Table 3: Height distribution in masked and unmasked group			
Height (in cm)	**Masked**	**Unmasked**	
154-165	15 (30%)	14 (28%)	P- value=0.467
166-175	27 (74%)	23 (46%)	
176-185	8 (16%)	13 (26%)	
Total	**50 (100%)**	**50 (100%)**	

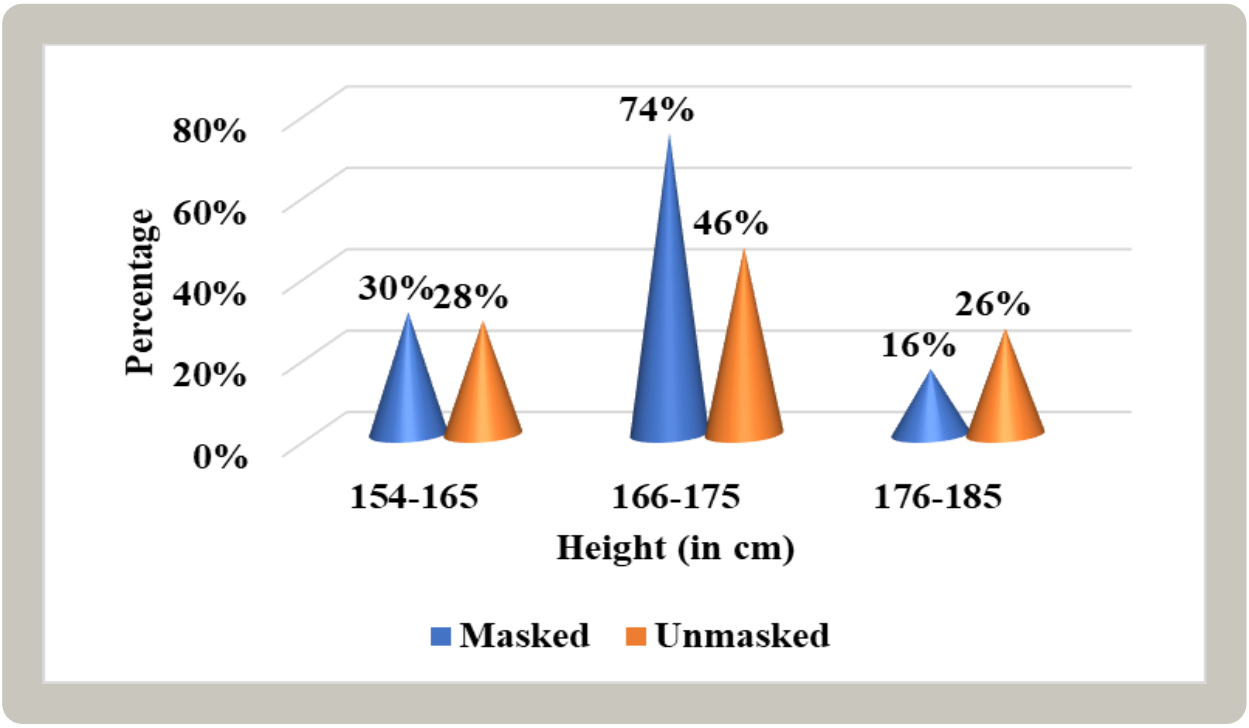

Figure 3: Height distribution masked and unmasked group

Table 3 shows the height distribution of the study group. In the masked group, the height of the patients ranged from 154 cm to 185 cm. The largest proportion of patients in the masked group (74%) were in the 166–175 cm category, followed by 30% in the 154–165 cm category. In the unmasked group, the largest proportion was also in the 166–175 cm category (46%), followed by the 26% in the 176–185 cm category. The p value of 0.467 suggests that there was no statistically significant difference in height distribution between the two groups.

Table 4: Weight distribution in masked and unmasked group			
Weight (in kgs)	**Masked**	**Unmasked**	
51-60	6 (12%)	5 (10%)	P- value=0.209
61-70	22 (44%)	13 (26%)	
71-80	16 (32%)	26 (52%)	
81-90	6 (12%)	5 (10%)	
91-100	0 (0%)	1 (2%)	
Total	**50 (100%)**	**50 (100%)**	

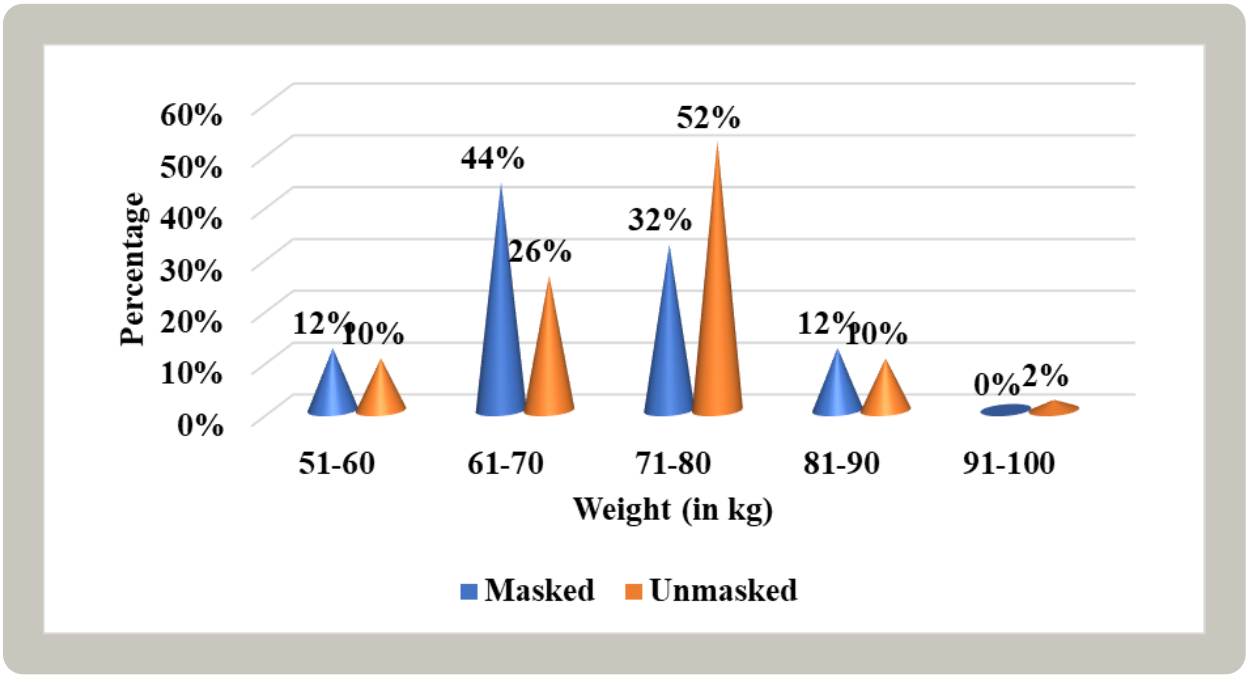

Figure 4: Weight distribution in masked and unmasked group

Table 4 shows the weight distribution of the study group. In the masked group, the weight of the patients ranged from 51 kg to 90 kg. The largest proportion of patients in the masked group (44%) were in the 61–70 kg category, followed by 32% in the 71–80 kg category. In the unmasked group, the largest proportion of patients (52%) were in the 71–80 kg category, followed by 26% in the 61–70 kg category. The lowest representation was in the 91–100 kg category (2% in the unmasked group and 0% in the masked group). The p value of 0.209 indicates no statistically significant difference in weight distribution between the two groups.

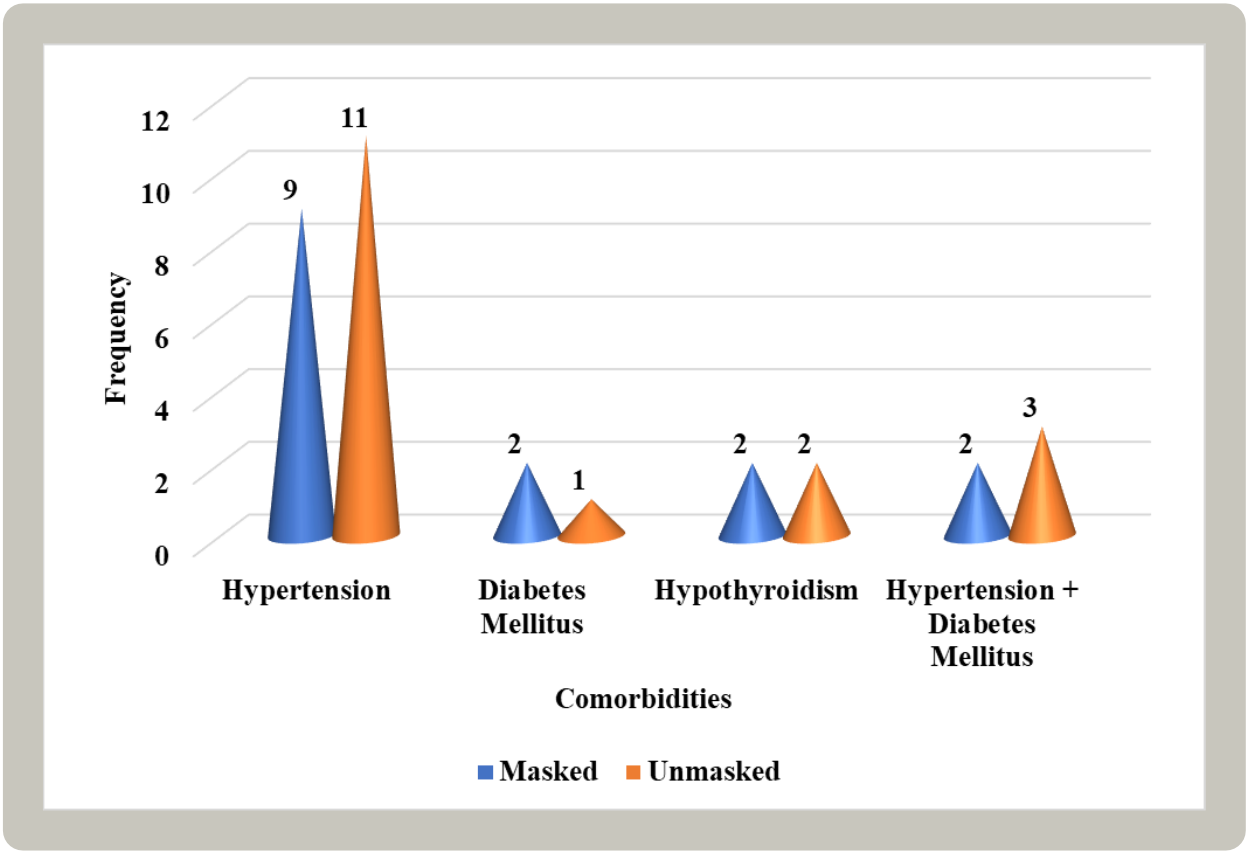

Figure 5: Comorbidities in masked and unmasked group

Table 6 shows the distribution of comorbidities in the study group. The most common comorbidity in the masked group was hypertension (9 patients), followed by diabetes mellitus (2 patients), hypothyroidism (2 patients), and a combination of hypertension and diabetes mellitus (2 patients). In the unmasked group, the most common comorbidity was hypertension (11 patients), followed by diabetes mellitus (1 patient), hypothyroidism (2 patients), and a combination of hypertension and diabetes mellitus (3 patients). The p value of 0.709 indicates no statistically significant difference in the presence of comorbidities between the two groups.

Table 5: Midazolam requirement in masked and unmasked group			
Midaz (in mg)	**Masked**	**Unmasked**	
1	9 (18%)	0 (24%)	**P value <0.001**
2	24 (48%)	12 (24%)	
3	17 (34%)	26 (52%)	
4	0	11 (22%)	
5	0	1 (2%)	

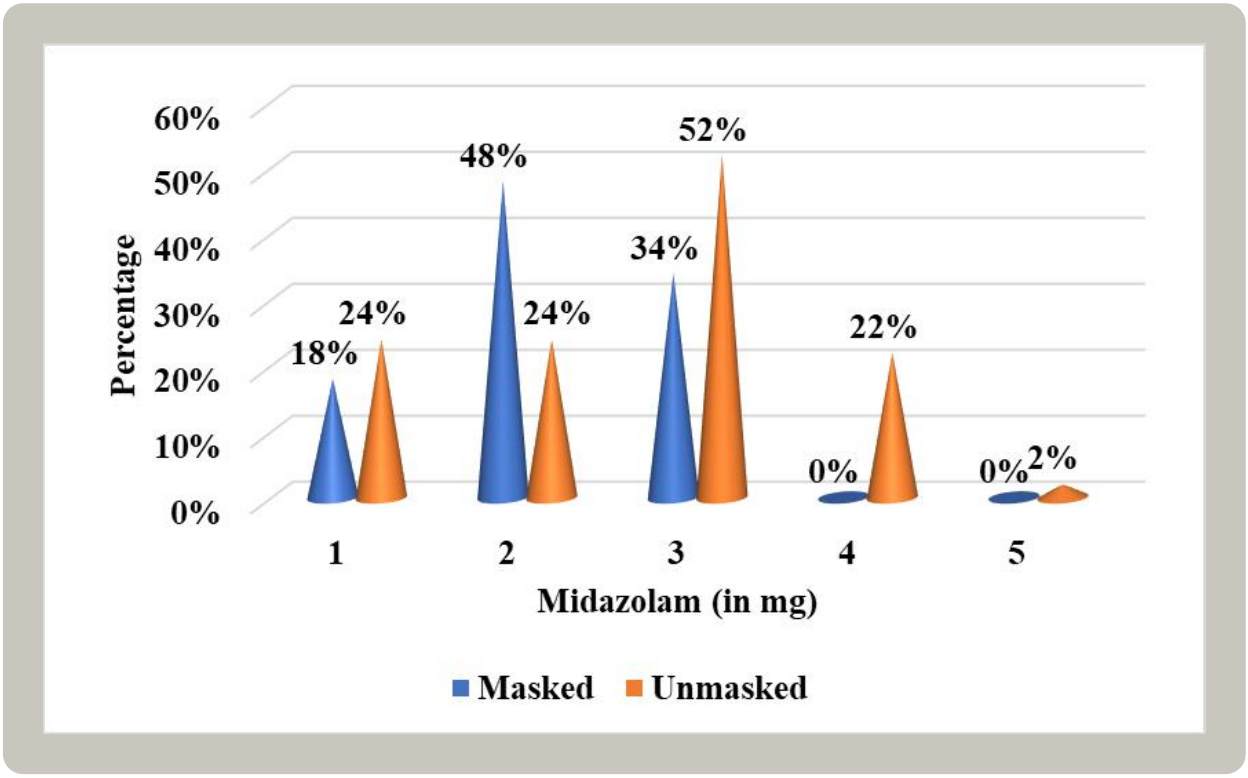

Figure 5: Midaz requirements in masked and unasked group

Table 7 shows the midazolam (midazolam) requirements for the study group. In the masked group, the most common dose was 2 mg (48%), followed by 3 mg (34%). No patients in the masked group required doses higher than 3 mg. In the unmasked group, the most common dose was 3 mg (52%), followed by 4 mg (22%). A small proportion (2%) required 5 mg. A p value of <0.001 indicates a statistically significant difference in the Midaz requirement between the two groups

Table 6: Time of sedation in masked and unmasked group			
Time (in min)	**Masked**	**Unmasked**	P value<0.001
Mean ± SD	9.1±2.98	13.3±3.53	

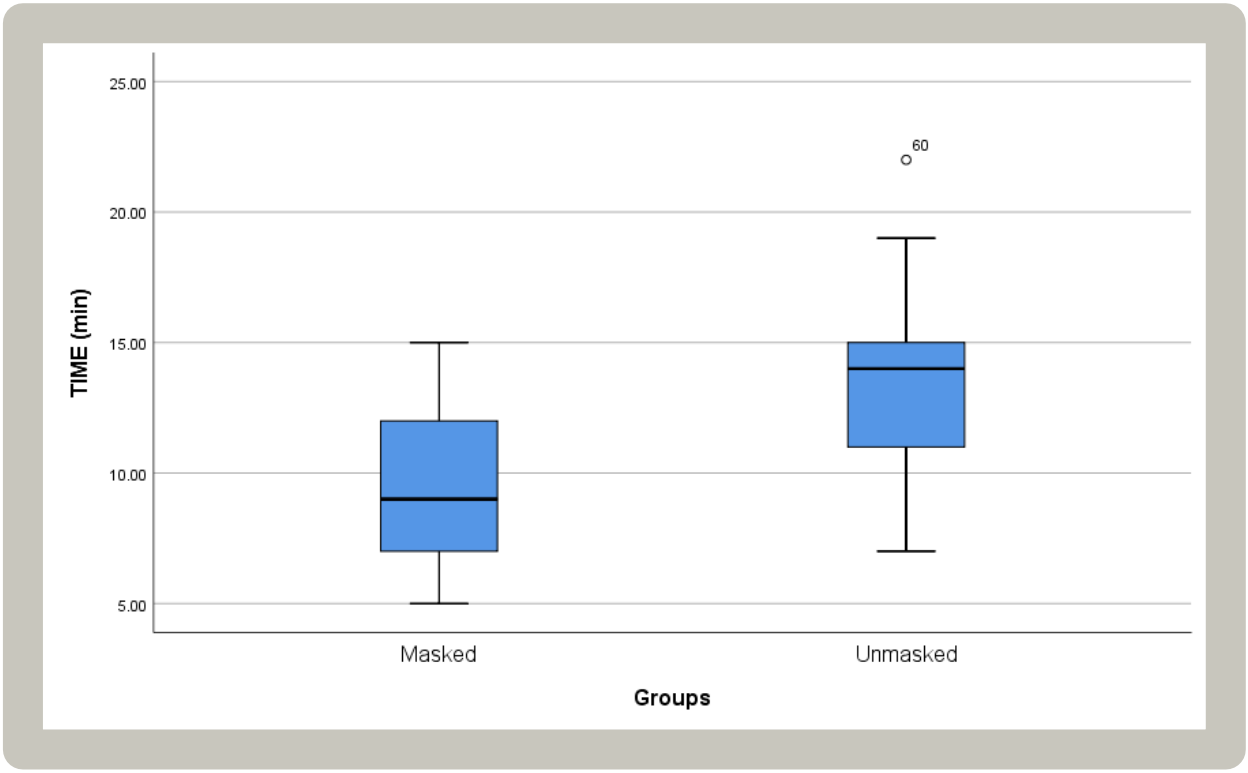

Figure 6: Boxplot of time in masked and unmarked group

Table 8 shows the time required for sedation in the study group. The mean sedation time in the masked group was 9.1 ± 2.98 minutes, whereas in the unmasked group, it was 13.3 ± 3.53 minutes. A p value of <0.001 indicated a statistically significant difference in sedation time between the two groups.

Table 7: Satisfaction with sedation in masked and unmasked group			
Satisfaction	**Masked**	**Unmasked**	P value = 0.029
Bad	0	5	
Not bad	1	12	
Good	15	18	
Very good	34	15	

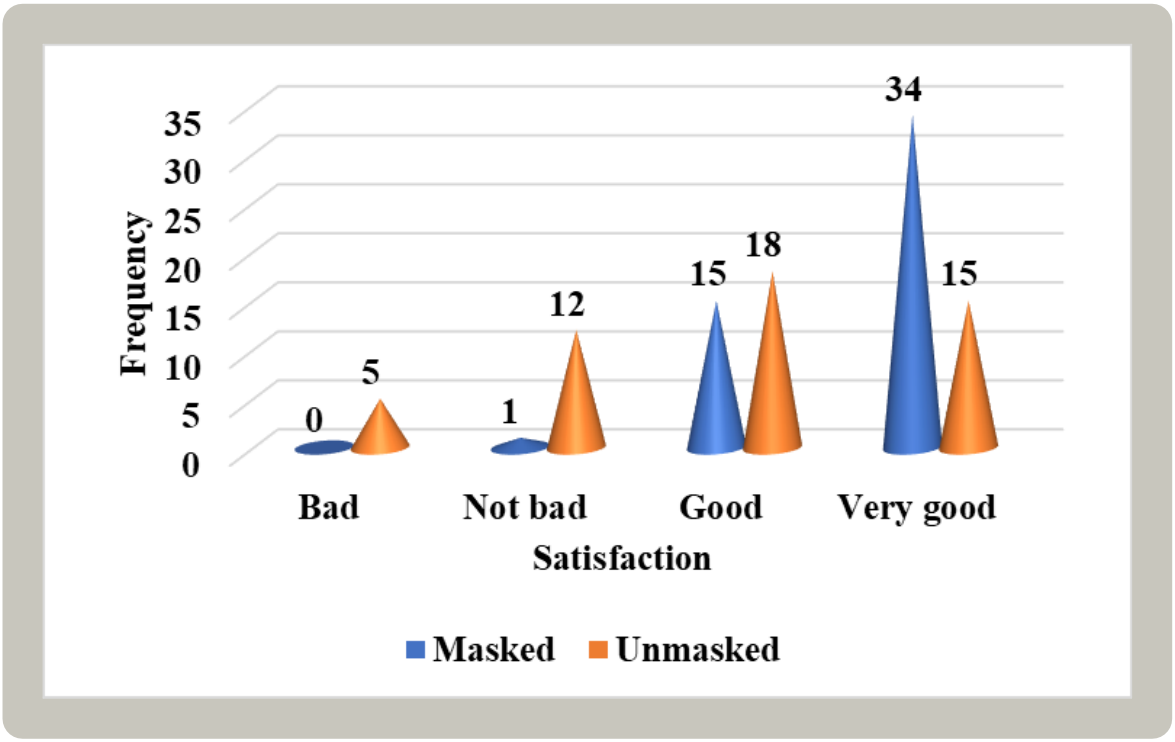

Figure 7: Satisfaction with sedation in masked and unmasked group

Table 9 shows the level of satisfaction with sedation among the study group. In the masked group, 68% of patients rated their satisfaction as very good, and 30% rated it as good. No patients rated their satisfaction as bad. In the unmasked group, 36% rated their satisfaction as very good, 36% rated it as good, 24% rated it as not bad, and 10% rated it as bad. The p value of 0.029 indicates a statistically significant difference in satisfaction, with the masked group reporting higher satisfaction with sedation.

Discussion

There was no statistically significant difference in the mean age of the patients in the masked group in this study, which was 44.7 ± 17.4 years, and in the unmasked group, which was 46.7 ± 16.3 years ($p = 0.978$). This finding supports previous findings by Sharma (2018), who also reported comparable age distributions during spinal anaesthesia with adjunctive methods and is consistent with reports by Dholakia (2020)and Das(2019). Although Singh and Verma (2021) suggested altered sedative pharmacodynamics in elderly patients , our findings align with those of Gupta and Sinha (2017) , who reported no age-based variation in the midazolam requirement. The gender distribution was similar across groups, with males comprising 60% of the masked group and 64% of the unmasked group ($p = 0.680$). This finding is consistent with those of Thomas (2016)and Kothari (2019) , who reported no sex-based variation in sedative needs during regional anaesthesia.

Although Johnson and Kale (2020) suggested that females may be more sensitive to benzodiazepines, this was not observed in our study or in the findings of Agarwal (2018). Height and weight were also comparable, with no statistically significant differences ($p = 0.467$ and 0.209, respectively).

The most striking finding was the significantly lower mean midazolam requirement in the masked group (2.06 ± 0.55 mg) than in the unmasked group (3.14 ± 0.59 mg), with a highly significant p value (<0.001). These results are in line with those of Chakraborty and Sen (2021), who demonstrated a 35% reduction in benzodiazepine requirements with eye mask usage, and are corroborated by those of Saxena (2020), Rani (2017), and Iyengar (2022) , who attributed the reduced sedative needs to sensory deprivation‟s effect on cortical arousal.

Furthermore, the sedation onset time was notably shorter in the masked group (9.1 ± 2.98 min) than in the unmasked group (13.3 ± 3.53 min), which was statistically significant ($p < 0.001$). These

findings support the findings of Trivedi (2021), Sharma and Bansal (2020) and Patel (2018), who reported that sensory deprivation hastens the onset of sedation by reducing environmental stimulation.

Satisfaction levels were markedly higher in the masked group, with 68% reporting "very good" satisfaction and no dissatisfaction, than in the unmasked group, with 36% and 10%, respectively ($p = 0.029$). Our findings mirror those of Rawal (2020) , Pande (2019) and Murthy (2021), all of whom reported enhanced satisfaction with sensory adjuncts such as eye masks and music therapy during spinal anaesthesia.

In our study, the occurrence of relative hypotension was 12% in the masked group and 16% in the unmasked group, whereas relative bradycardia occurred in 14% and 16%, respectively. Although these incidents were more common in the unmasked group, the differences were not statistically significant. These findings are comparable to those reported by Bonnet et al. (1990), who noted that spinal anaesthesia itself contributes to vasodilation and bradycardia by blocking sympathetic outflow, and these effects are relatively independent of the sedative adjunct used. Compared with the masked group (6%), the unmasked group presented a slightly greater incidence of apnoea (8%). While this difference is small, it is clinically important, as even minimal respiratory depression can be exacerbated by sedatives such as midazolam, particularly when they are used with opioids. Bailey et al. (1990) emphasised the risk of hypoxemia and apnoea with the combination of midazolam and fentanyl, supporting the need for dose reduction strategies, such as sensory deprivation with an eye mask.
Interestingly, there were no cases of sedation failure (defined as the inability to achieve a MOAA/S score of 3) in either group, indicating that both protocols were effective in achieving target sedation. This aligns with the work of Fassoulaki (2000),who demonstrated effective sedation with reduced hypnotic requirements under spinal anaesthesia.

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