Section: Anaesthesia

Original Research Article

COMPARISON OF I.V. DEXMEDETOMEDINE AND I.V. LOW DOSE KETAMINE FOR POST SPINAL ANAESTHESIA SHIVERING

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ABSTRACT

Background: Shivering is a common and distressing experience to many patients which occurs either during or immediately after the surgery. Various drugs have been used to treat or prevent postoperative shivering. The present study was carried out with the aim to study the efficacy of dexmedetomidine and ketamine in the prevention of intra-operative shivering, to assess the level of sedation and side effects caused by the study drugs. **Materials and Methods:** This prospective observational study was carried out in the Department of Anaesthesia, Chirayu Medical College and Hospital, Bhopal, among 80 consented patients allocated into 2 groups of 40 each: Group D (I.V. Dexmedetomidine 0.5µg/kg in 100ml NS) and Group K (I.V. Ketamine 0.5mg/kg in 100ml NS), using a proforma, pre-anaesthetic evaluation, investigations followed by induction of anaesthesia and administration of test drug. Data was collected, compiled and analysed using SPSS 22.0 (trial version). **Result:** Most participants in Group D (32.5%) and Group K (37.5%) belonged to 31-40 years and 41-50 years age group, respectively. Males (Group D=62.5%; Group K=55%), those of 51-70 kg weight band (Group D=80%; Group K=77.5%) and ASA Grade 1 (Group D=57.5%, Group K=55%) constituted the majority. Shivering was present in 25% and 32.5% patients in Groups D and K. In Group D, 20% had Grade 1 shivering, while in Group K, 12.5% had Grade 4 shivering. Bradycardia was seen in only 12.5% participants in Group D, and was absent in Group K. Hypotension was present in 25% Group D participants. Heart rate in Group D was significantly lower compared to Group K at 5, 10 and 15 minutes. The systolic blood pressure in Group K was lower than Group D at baseline, time of induction, 5, 10, 30, 40 and 50 minutes. The diastolic blood pressure when measured was lower in Group K as compared to Group D at all the time intervals. The SpO2 in Group D was lower than Group K during induction, at 20, 30 and 40 minutes. Temperature in Group K was lower than Group D at 5 and 50 minutes. Sedation in Group D was lower than Group K at all the time intervals. **Conclusion:** Prophylactic dexmedetomidine and ketamine both reduced the incidence of shivering. However, in the initial perioperative period dexmedetomidine significantly reduced shivering in comparison to ketamine. We thus concluded that Dexmedetomidine was better than Ketamine in prevention of post spinal shivering.

INTRODUCTION

Shivering is a common and distressing experience to many patients which occurs either during or immediately after the surgery. It is defined as an involuntary, repetitive activity of skeletal muscles.[1] In patients undergoing neuraxial anaesthesia, shivering is a normal thermoregulatory mechanism as evidenced by the presence of vasoconstriction before shivering.[2] Spinal anaesthesia impairs the thermoregulatory system by inhibiting vasoconstriction, which plays an important role in temperature regulation,[3] and results in redistribution of core heat to the periphery from the trunk [below the level of block].[4] Both these effects predispose patients to hypothermia and shivering. Studies in recent years have shown that even mild hypothermia (10C – 20C) can triple the incidence of

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adverse cardiac outcomes. An increase in surgical blood loss and increase in need for blood transfusion by 20% is also noted. All these factors lead to prolonged hospitalization. Shivering also leads to an increase in oxygen consumption and carbon dioxide production by 2-3 folds. Shivering can also increase catecholamine production, lactic acidosis, intraocular pressure, intracranial pressure.[5] Mild shivering increases oxygen consumption like that produced by light exercise but severe shivering can increase oxygen consumption and metabolic rate by 100 – 600%. This can prove detrimental to patients with limited cardiac reserve. Shivering also creates difficulty in monitoring the patients as most of the multi parameter monitors used for anaesthesia show erroneous values.

Various drugs have been used to treat or prevent postoperative shivering. Dexmedetomidine is a highly selective α2-adrenoceptor agonist with potent effects on the central nervous system. However, Dexmedetomidine may be a good choice because of its dual effects of anti-shivering and sedation. It exerts its dual effects while avoiding vasoconstriction and increasing the level of the shivering threshold. Ketamine is a non-competitive - NMDA receptor antagonist with an effect of thermoregulation, and it showed favourable outcomes in reducing the incidence of hypotension &bradycardia.

The present study was carried out with the aim to study the efficacy of dexmedetomidine and ketamine in the prevention of intra-operative shivering, to assess the level of sedation and side effects caused by the study drugs.

MATERIALS AND METHODS

This prospective observational study was carried out in the Department of Anaesthesia, Chirayu Medical College and Hospital, Bhopal, after approval by Ethical Committee. 80 consented patients of age group 18 – 65 years belonging to American society of anaesthesiologists class I or II and posted for lower abdominal surgeries and lower limb surgeries under spinal anaesthesia were included in the study. All those with known hypersensitivity or allergy to study drug; cardio-pulmonary, renal or hepatic impairment; known history of substance or alcohol abuse; patients who received any pre-medication; with an initial core temperature >37.5˚C or <35.5˚C; requiring blood transfusion during surgery; hypo- or hyperthyroidism; convulsions or psychiatric disorders; refusal; pregnant and lactating women were excluded from the study.This sample size was calculated based on the pilot study and statistical reports of previous studies. The group sizes (n=40) were calculated to find out the efficiency of study drugs in prevention of shivering with a power of 95% [assuming a variability (S.D.) of ±10%] and a significance level of 0.05. The patients were randomly allocated into 2 groups of 40 each and were named as Group D (I.V. Dexmedetomidine 0.5µg/kg in 100ml NS) and Group K (I.V. Ketamine 0.5mg/kg in 100ml NS).

Pre-anaesthetic evaluation was done, recording a detailed history and performing a complete physical examination. Basic routine investigations were carried out. Induction of anaesthesia was carried out under strict aseptic precautions. The test drug was infused in 100ml NS by a blinded observer over 10 minutes along with IV fluid administration at 6ml/kg/hr, oxygen via face mask at 5L/min and Inj. Ondansetron 4mg IV. Patient's baseline Heart rate, Blood pressure, Temperature and SpO2 were monitored for every 5minutes till 20 minutes and then every 10 minutes till 60 minutes. Data was collected, compiled and analysed using SPSS 22.0 (trial version) using Chi-square and ANOVA test.

RESULTS

[Table 1] displays the socio-demographic data of the study participants. Most of the study participants in Group D (32.5%) and Group K (37.5%) belonged to the age group of 31-40 years and 41-50 years, respectively. Males (Group D=62.5%; Group K=55%), those belonging to 51-70 kg weight band (Group D=80%; Group K=77.5%) and ASA Grade 1 (Group D=57.5%, Group K=55%) constituted the majority. The mean duration of procedure in Group D and Group K was 70.7500±25.5842 and 75.6250±21.1280 minutes respectively (p-value=0.3556).

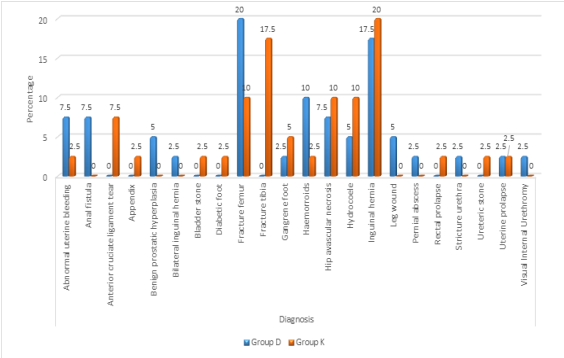

Figure 1: Distribution of study participants on the basis of diagnosis among the two groups

[Figure 1] shows distribution of diagnosis among the two groups. Most patients in Group D were those with a femur fracture (20%) followed by inguinal hernia (17.5%), haemorrhoids (10%), abnormal uterine bleeding (7.5%), anal fistula (7.5%) and avascular necrosis of the hip (7.5%). Among patients in Group K, the maximum number of cases were of inguinal hernia (20%), followed by fracture tibia (17.5%), avascular necrosis of the hip (10%) and hydrocele (10%). P-value (0.0681) was found insignificant on calculation.

The distribution of study participants on the basis of shivering, its grade, bradycardia and hypotension is shown in [Table 2]. Shivering was present in 25% and 32.5% of the patients in Groups D and K. With

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respect to grade of shivering, in Group D, a major proportion of the study participants (20%) had shivering of Grade 1, while remaining 5% had Grade 2 shivering. None of the participants had shivering of Grades 3 and 4; while in Group K, majority of the participants (12.5%) had Grade 4 shivering while Grades 1 and 2 were seen in 7.5% participants each, with the remaining 5% showing Grade 3 (p-value=0.04;significant). Bradycardia was seen in only 12.5% of the participants in Group D, while it was absent in participants of Group K (p-value=0.0217; significant). Hypotension was present in 25% of the participants of Group D while none of the participants in Group K experienced this (p-value=0.0008; significant).

Table 1: Distribution of study participants on the basis of socio-demographic variables

Socio demographic variables		Group D		Group K		p-values
		No.	%	No.	%	
Age group	20-30 years	11	27.5	11	27.5	0.5847
	31-40 years	13	32.5	12	30.0	
	41-50 years	11	27.5	15	37.5	
	51-60 years	5	12.5	2	5.0	
	Total	40	100	40	100	
	Mean±SD (years)	38.3750±10.2399		37.9500±9.7559		0.8498
Gender	Female	15	37.5	18	45.0	0.458
	Male	25	62.5	22	55.0	
	Total	40	100	40	100	
Weight	31-50 Kg	6	15.0	8	20.0	0.7280
	51-70 Kg	32	80.0	31	77.5	
	>70 Kg	2	5.0	1	2.5	
	Total	40	100	40	100	
	Mean±SD (kg)	57.8500±8.4172		56.0750±8.3862		
ASA Grade	1	23	57.5	22	55.0	0.8228
	2	17	42.5	18	45.0	
	Total	40	100	40	100	

Table 2: Distribution of study participants on the basis of various parameters

Variables		Group D		Group K		p-values
		No.	%	No.	%	
Shivering	Yes	10	25.0	13	32.5	0.4615
	No	30	75.0	27	67.5	
	Total	40	100	40	100	
Shivering Grade [6]	0	30	75.0	27	67.5	0.0471*
	1	8	20.0	3	7.5	
	2	2	5.0	3	7.5	
	3	0	0.0	2	5.0	
	4	0	0.0	5	12.5	
	Total	40	100	40	100	
Bradycardia	Yes	5	12.5	0	0.0	0.0217*
	No	35	87.5	40	100.0	
	Total	40	100	40	100	
Hypotension	Yes	10	25.0	0	0.0	0.0008*
	No	30	75.0	40	100.0	
	Total	40	100	40	100	

*p-value is significant

The distribution of study participants on the basis of shivering, its grade, bradycardia and hypotension is shown in [Table 2]. Shivering was present in 25% and 32.5% of the patients in Groups D and K. With respect to grade of shivering, in Group D, a major proportion of the study participants (20%) had shivering of Grade 1, while remaining 5% had Grade 2 shivering. None of the participants had shivering of Grades 3 and 4; while in Group K, majority of the participants (12.5%) had Grade 4 shivering while Grades 1 and 2 were seen in 7.5% participants each, with the remaining 5% showing Grade 3 (p-value=0.04;significant). Bradycardia was seen in only 12.5% of the participants in Group D, while it was absent in participants of Group K (p-value=0.0217; significant). Hypotension was present in 25% of the participants of Group D while none of the participants in Group K experienced this (p-value=0.0008;significant).

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Table 3: Distribution of study participants on the basis of vitals and sedation at different time intervals between the two groups

Variable	Group D			Group K					
	N	Mean	SD	n	Mean	SD	Difference	95% CI	P a
HR-Base	40	80.8750	9.7854	40	78.1500	10.3492	-2.7250	-7.2084 to 1.7584	0.2299
HR-Ind.	40	79.2250	9.5124	40	76.4250	10.0840	-2.8000	-7.1637 to 1.5637	0.2052
HR-5	40	64.8250	8.2365	40	78.3000	8.5731	13.4750	9.7327 to 17.2173	<0.0001*
HR-10	40	64.9000	8.4786	40	78.9500	7.5649	14.0500	10.4732 to 17.6268	<0.0001*
HR-15	40	65.2750	8.2213	40	79.5750	7.0634	14.3000	10.8881 to 17.7119	<0.0001*
HR-20	40	70.6000	8.6196	40	80.4500	6.6292	9.8500	6.4271 to 13.2729	<0.0001*
HR-30	40	77.3500	5.9250	40	78.6000	5.7593	1.2500	-1.3510 to 3.8510	0.3416
HR-40	40	79.8500	5.1269	40	79.5250	5.8528	-0.3250	-2.7742 to 2.1242	0.7923
HR-50	40	79.3250	6.2895	40	79.3500	7.3084	0.02500	-3.0102 to 3.0602	0.9870
HR-60	40	79.3250	4.6486	40	79.2750	5.3301	-0.05000	-2.2763 to 2.1763	0.9645
SBP-Base	40	124.4750	11.8516	40	121.8750	11.2983	-2.6000	-7.7543 to 2.5543	0.3184
SBP-Ind.	40	122.1000	10.9727	40	119.6000	10.7579	-2.5000	-7.3371 to 2.3371	0.3067
SBP-5	40	121.5500	7.4488	40	119.7500	7.5812	-1.8000	-5.1456 to 1.5456	0.2874
SBP-10	40	120.4750	6.8948	40	119.2500	7.1995	-1.2250	-4.3629 to 1.9129	0.4394
SBP-15	40	118.2750	8.9586	40	118.2500	8.5986	-0.02500	-3.9338 to 3.8838	0.9899
SBP-20	40	117.5000	11.6178	40	117.7250	10.7082	0.2250	-4.7485 to 5.1985	0.9285
SBP-30	40	118.5250	7.5651	40	118.4000	7.1029	-0.1250	-3.3915 to 3.1415	0.9395
SBP-40	40	120.1750	7.2178	40	120.0750	7.3113	-0.10000	-3.3340 to 3.1340	0.9511
SBP-50	40	123.8750	7.8551	40	123.7500	7.8307	-0.1250	-3.6164 to 3.3664	0.9434
SBP-60	40	123.5000	7.8414	40	124.0250	7.4506	0.5250	-2.8799 to 3.9299	0.7597
DBP-Base	40	78.0250	6.7425	40	76.1500	5.9810	-1.8750	-4.7121 to 0.9621	0.1921
DBP-Ind.	40	77.3750	6.2540	40	76.0750	5.8106	-1.3000	-3.9872 to 1.3872	0.3385
DBP-5	40	76.7000	6.1067	40	75.5250	5.8000	-1.1750	-3.8261 to 1.4761	0.3803
DBP-10	40	77.3750	6.5972	40	75.8000	6.1736	-1.5750	-4.4191 to 1.2691	0.2736
DBP-15	40	75.6750	4.7845	40	74.5500	4.4257	-1.1250	-3.1766 to 0.9266	0.2783
DBP-20	40	75.5500	4.8249	40	75.2000	4.5019	-0.3500	-2.4272 to 1.7272	0.7382
DBP-30	40	77.2250	4.0095	40	76.7750	4.3470	-0.4500	-2.3116 to 1.4116	0.6317
DBP-40	40	74.1250	6.1109	40	74.0750	5.7396	-0.05000	-2.6890 to 2.5890	0.9700
DBP-50	40	77.1750	2.9776	40	76.6000	3.7540	-0.5750	-2.0833 to 0.9333	0.4502
DBP-60	40	77.3500	4.2761	40	77.2000	4.8633	-0.1500	-2.1885 to 1.8885	0.8839
SP02-Base	40	97.8750	1.1808	40	98.2250	1.0739	0.3500	-0.1524 to 0.8524	0.1694
SP02-Ind.	40	98.7750	0.6597	40	98.9250	0.7299	0.1500	-0.1597 to 0.4597	0.3379
SP02-5	40	98.6500	0.4830	40	98.6000	0.4961	-0.05000	-0.2680 to 0.1680	0.6492
SP02-10	40	98.7750	0.4229	40	98.6750	0.4743	-0.1000	-0.3000 to 0.1000	0.3227
SP02-15	40	98.7750	0.4229	40	98.7750	0.4229	0.0000	-0.1883 to 0.1883	1.0000
SP02-20	40	99.2000	0.4051	40	99.2500	0.4385	0.05000	-0.1379 to 0.2379	0.5978
SP02-30	40	99.1000	0.3038	40	99.1250	0.3349	0.02500	-0.1173 to 0.1673	0.7275
SP02-40	40	99.3500	0.4830	40	99.4250	0.5006	0.07500	-0.1440 to 0.2940	0.4974
SP02-50	40	99.2750	0.4522	40	99.2750	0.4522	0.0000	-0.2013 to 0.2013	1.0000
SP02-60	40	99.2750	0.4522	40	99.2750	0.4522	0.0000	-0.2013 to 0.2013	1.0000
Temp-Base	40	36.2850	0.1748	40	36.2650	0.1805	-0.02000	-0.09909 to 0.05909	0.6161
Temp-Ind.	40	36.1050	0.1600	40	36.1100	0.1516	0.005000	-0.06439 to 0.07439	0.8863
Temp-5	40	36.2250	0.1256	40	36.1825	0.1338	-0.04250	-0.1003 to 0.01525	0.1469
Temp-10	40	35.9425	0.1107	40	35.9475	0.1037	0.005000	-0.04275 to 0.05275	0.8354
Temp-15	40	35.9950	0.2828	40	35.9975	0.2655	0.002500	-0.1196 to 0.1246	0.9676
Temp-20	40	36.1750	0.2035	40	36.1950	0.2148	0.02000	-0.07313 to 0.1131	0.6702
Temp-30	40	36.1850	0.2983	40	36.2000	0.3072	0.01500	-0.1198 to 0.1498	0.8252
Temp-40	40	36.1800	0.3023	40	36.1800	0.3212	7.1054E-015	-0.1388 to 0.1388	1.0000
Temp-50	40	36.2800	0.2747	40	36.2525	0.2819	-0.02750	-0.1514 to 0.09642	0.6598
Temp-60	40	36.3125	0.2584	40	36.3175	0.2745	0.005000	-0.1137 to 0.1237	0.9334
SED-Base	40	1.0000	0.0000	40	1.0000	0.0000	0.0000	0.0000 to 0.0000	-
SED-Ind.	40	1.0000	0.0000	40	1.0000	0.0000	0.0000	0.0000 to 0.0000	-
SED-5	40	1.0000	0.0000	40	1.0000	0.0000	0.0000	0.0000 to 0.0000	-
SED-10	40	1.8000	0.8533	40	2.0000	0.9058	0.2000	-0.1917 to 0.5917	0.3126
SED-15	40	1.9000	0.8102	40	2.1250	0.8224	0.2250	-0.1384 to 0.5884	0.2214
SED-20	40	2.0000	0.7511	40	2.1500	0.8022	0.1500	-0.1959 to 0.4959	0.3906
SED-30	40	1.9750	0.7675	40	2.0250	0.8912	0.05000	-0.3202 to 0.4202	0.7887
SED-40	40	1.4500	0.5970	40	1.5500	0.6385	0.1000	-0.1752 to 0.3752	0.4715
SED-50	40	1.4000	0.5905	40	1.5000	0.6405	0.1000	-0.1742 to 0.3742	0.4700
SED-60	40	1.2750	0.4522	40	1.4000	0.4961	0.1250	-0.08631 to 0.3363	0.2425

*p-value is significant

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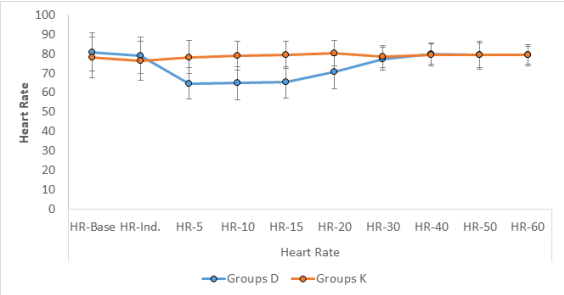
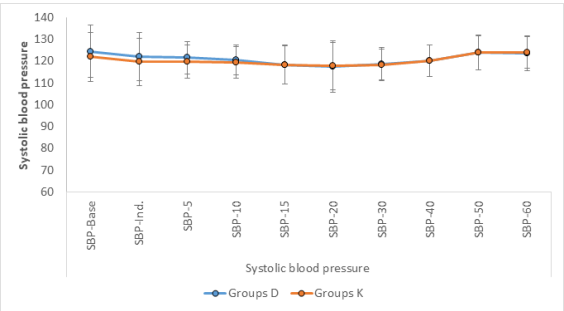
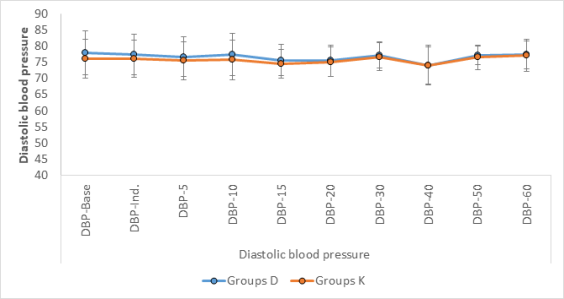
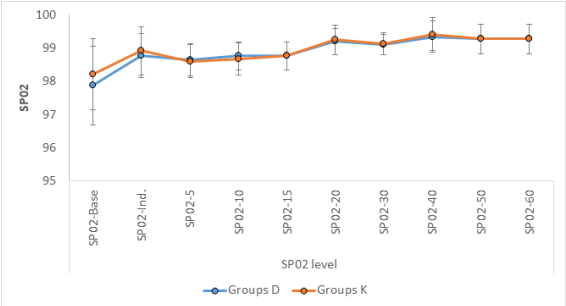
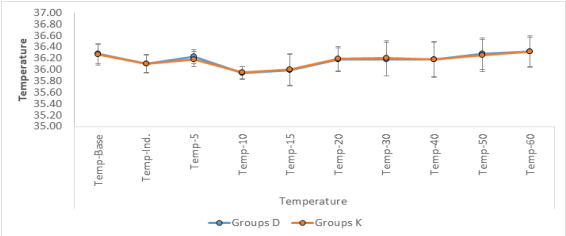


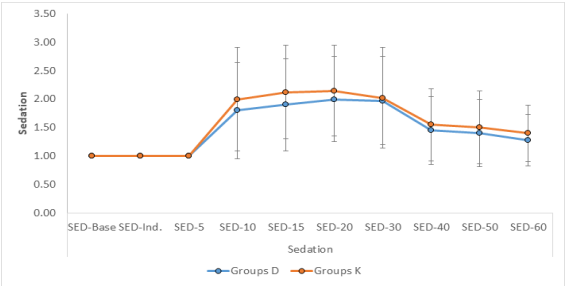
[Table 3] displays the distribution of study participants on the basis of vitals and sedation at different time intervals between the two groups. The heart rate in Group D was significantly lower as compared to Group K at 5 minutes, 10 minutes, with maximum difference being at 15 minutes (p-value=<0.001). The systolic blood pressure in Group K was lower than Group D at baseline, time of induction, 5, 10, 30, 40 and 50 minutes. The diastolic blood pressure when measured was lower in Group K as compared to Group D at all the time intervals. It was lowest in Group K at 10 minutes after induction. The SpO2 levels in Group D were lower than Group K at the time of induction, 20, 30 and 40 minutes. After induction, the temperature in Group K was lower than Group D at 5 minutes and 50 minutes. At the rest of the time intervals, the values were lower in Group D than Group K. Sedation was assessed by a four point scale, and it was observed that sedation in Group D was lower than Group K at all the time intervals.[6,7]











DISCUSSION

The present study was carried out among participants of 20-60 years age group, with majority belonging to age group 31-40 and 41-50 years in Group d and K respectively. Murmu R et al,[8] Tekeli AE et al,[9] Rehim SS et al,[10] and Reddy AV et al,[11] conducted the study in similar age groups. In our study, males comprised the majority in both the groups, which was in concordance with the findings of Kumar RA et al,[12] Rehim SS et al,[10] Ameta N et al.[13] Females comprised the majority in a study by Tekeli AE et al.[9] As observed in the present study, majority of the study participants in both groups were ASA Grade 1. Similar findings were observed by Kumar RA et al,[12] Kaur G et al,[14] Tekeli AE et al,[9] Rehim SS et al.[10] On the contrary, Houssein MM et al,[15] observed majority participants to be of ASA Grade 2.

It was reported in the present study that shivering was present more among participants of Group K than Group D, with an insignificant p-value. Similarly, Murmu R et al,[8] observed higher incidence of shivering in Group K as compared to Group D. However, contrary to our study, the p-value was found to be significant. Kumar RA et al,[12] reported that compared to Ketamine, Dexmedetomidine demonstrated a higher prevalence of decreased intraoperative shivering. The findings in studies by Ameta N et al,[13] Reddy AV et al,[11]

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and Houssein MM et al,[15] were also concordant to our study.

It was noted in the present study that in Group D, 20% had Grade 1 shivering, while the rest had Grade 2. None of the participants had shivering of Grades 3 and 4. In Group K, 12.5% had Grade 4 shivering while Grades 1 and 2 were seen in 7.5% participants each, with the rest showing Grade 3 (p-value=0.04; significant). Similarly, Murmu R et al,[8] observed that shivering of Grades 3 and 4 were present in patients of Group K,[11] patients of which required a rescue drug while none in Group D did (p-value=<0.0007). In a study by Ameta N et al,[13] majority developed Grade 1 shivering in group D while majority in Group K had Grade 2 shivering. Also, 6% in group D and 12% in Group K required 25mg IV dose of injection Pethidine for control of higher grade of shivering. Houssein MM et al,[15] and Reddy AV et al,[11] also reported that shivering was less in Group D as compared to Group K.

In the present study, bradycardia was seen in only 12.5% participants in Group D, while it was absent in Group K (p-value=0.0217; significant). Similarly, Murmu R et al,[8] reported that 10 out of 75 patients had bradycardia in Group D while only one patient in Group K suffered from it (p-value=0.005; significant). Kumar RA et al,[12] reported that bradycardia was observed only in Group D in 3 patients. In a study by Rehim SS et al,[10] while no bradycardia was detected in the ketamine group, three patients in the dexmedetomidine group and the two patients in the combination group had bradycardia and required treatment with 0.5 mg of atropine intravenously (no statistical significance was observed). Ameta N et al,[13] reported that 10% patients in Group D and 4% in Group K required treatment for symptomatic bradycardia in their study.

It was found in the present study that hypotension was present in 25% participants of Group D while none in Group K experienced this (p-value=0.0008; significant). Kumar RA et al,[12] observed that hypotension was observed only in Group D. In a study by Rehim SS et al,[10] 16.66% patients in Group D, compared to 10% in the Group K, and 13.3% patients in the dexmedetomidine+ketamine group, presented with hypotension (p-value=0.04).

The heart rate in Group D was significantly lower as compared to Group K at 5 and 10 minutes, maximum difference being at 15 minutes (p-value=<0.001; significant); in our study. Similar findings were reported by Murmu R et al.[8] Kaur G et al,[14] reported that 5 minutes after administering the premedication, the heart rate in Group D fell to its highest level (16.4% below baseline); this decrease lasting for the whole duration, necessitating adminstration of atropine in two patients. Tekeli AE et al,[9] reported that the HR in Group D fell significantly lower than that in Group K especially at 0 and 3 minutes (p-value=0.000). Ameta N et al [13] reported that the highest and lowest mean values of heart rate were found in Group K and Group D respectively. Reddy AV et al,[11] observed a highly statistically significant difference (p-value<0.0001) between the two groups post-induction, with HR in Group D lower than that in Group K. Houssein MM et al,[15] observed that HR was lower in Group D in comparison to Group K at all the time intervals. However, it was significantly lower at 40, 50 and 60 minutes after induction (p-value<0.001 at each interval). On the contrary, Rehim SS et al,[10] found insignificant difference between the dexmedetomidine, ketamine and combination group in relation to Heart Rate at different intervals.

The systolic blood pressure, as per our study, in Group K was lower than Group D at baseline, at the time of induction, at 5, 10, 30, 40 and 50 minutes. The p-values was, however, insignificant. The DBP was lower in Group K as compared to Group D at all the time intervals. After induction, it was lowest in Group K at 10 minutes. Tekeli AE et al,[9] reported that the SBP in Group K measured was lower than Group D post-induction especially at 0 minutes (p-value=0.000). The DBP in Group K was found to be lower than Group D at 0, 3 and 5 minutes but the results were not significant. Rehim SS et al,[10] stated that there was no statistically significant difference between the different groups with regards to SBP and DBP.

The SpO2 levels in the present study were lower in Group D than in Group K at baseline and at the time of induction. The levels were lower in Group K at 5 and 10 minutes after induction. As per Tekeli AE et al,[9] though the SpO2 was reported to be lower in Group D as compared to Group K at 0, 3 and 5 minute intervals, the results were not statistically significant. Reddy AV et al,[11] and Houssein MM et al,[15] also found no statistically significant difference between Groups D and K.

In the present study, after induction, temperature in Group K was lower than Group D at 5 minutes and 50 minutes. Murmu R et al,[8] reported similar findings, where the temperature at 15th minute of induction was lower in Group K as compared to Group D and the results were statistically significant. As per Reddy AV et al,[11] the temperature was significantly lower (p-value<0.0001) in Group K as compared to Group D. Houssein MM et al,[15] reported that the body temperature was lower in Group K than Group D, similar to our study at 40, 50 and 60 minutes after induction (p-value<0.001). However, Kumar RA et al,[12] and Rehim SS et al,[10] found no statistical difference. Ameta N et al,[13] reported that there was minimal increase in mean surface temperature in Group D in their study.

The sedation in Group D was lower than Group K at all the time intervals in the present study. Contrarily, higher incidence of sedation was observed in a study by Murmu R et al,[8] (p-value=0.002). Kumar RA et al,[12] observed that in majority, dexmedetomidine produced a satisfactory sedative score of 3 within 5 minutes that lasted comfortably for 90 minutes

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without causing hemodynamic abnormalities. Houssein MM et al,[15] concluded that patients in Group D were more sedated than patients in Group K.

CONCLUSION

Shivering is a quite common complication following induction of anaesthesia in patients and proves to be very uncomfortable. It can have serious consequences since it increases the consumption of oxygen. Prevention and effective treatment of shivering-related complications is a crucial step in improving postoperative comfort. Prophylactic dexmedetomidine and ketamine both reduced the incidence of shivering. However, in the initial perioperative period dexmedetomidine significantly reduced the shivering associated with spinal anaesthesia in comparison to ketamine. So, we can conclude that Dexmedetomidine is better than Ketamine in prevention of post spinal shivering. But hypotension and bradycardia was also seen only with dexmedetomidine. In our study two drugs were compared which belong to two completely different groups with completely different mechanism of action. Therefore more studies with larger sample size are required to conclude which is better drug for post spinal anaesthesia shivering.

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