Discussion
DISCUSSION

The concept of intravenous anaesthesia is attractive both for the patient as well as for the anaesthetist. For patient it had the advantage of producing loss of consciousness without excitement, distress or sensation of smothering after produced by tightly pressed face mask. For the anaesthetist there is advantage of predictable anaesthesia which is rapid in onset without coughing or movement.

Total intravenous anaesthesia has gained popularity, partly in order to reduce pollution by volatile agents. Propofol has proven to be suitable as a hypnotic for TIVA. The drug has fast onset of action and rapid metabolism without accumulation. Also, the incidence of post-operative side effects i.e. nausea and vomiting are low. Propofol as no analgesic effect and is administered therefore in combination with a potent analgesic.

Ketamine in substancesthetic doses with propofol has gained attention in TIVA technique because of its powerful analgesic action in small doses without causing myocardial and respiratory depression. So it was though worth while to compare propofol in combination with ketamine from the popular combination i.e. propofol with fentanyl.
The analysis of data obtained from observation made on 60 patients of ASA grade I and II undergoing surgery under general anaesthesia, induced with either propofol and ketamine (group-I) or propofol and fentanyl (group-II) depicted that maximum number of patients (55%) belong to age group of 20-29 years and maximum number of patients (48.33%) were weighing between 51-60Kg. Out of 60 patients 37(61.67%) were male and 23(38.33%) were female though age and sex has no correlation with the selection of inducing agents.

In the present study, it was observed that induction of anaesthesia was faster with propofol and ketamine than the propofol and fentanyl. Mean induction time was 43.8±5.90 seconds in group-I while it was 50.5±6.76 in group II, this could have been because when propofol and ketamine were used in combination, are additive as hypnotic and anaesthetic end points and also because of onset of action is faster with ketamine than the fentanyl.

Propofol exert its action through GABA receptors. Propofol being highly lipophilic in nature rapidly crosses the blood brain barrier thus accounting for rapid onset of action. Ketamine is a potent analgesic, its anaesthetic and analgesic effects have been suggested to be mediated by
different mechanism. Ketamine interacts with N-methyl D-aspartate receptors, monoaminergic receptors, muscarinic receptors and voltage sensitive calcium channels. Analgesia produced by fentanyl is principally through interaction with mu(μ) receptor at supraspinal sites. Fentanyl also binds to much lesser degree, to the kappa (κ) opioid receptor.

The doses used for induction was fixed accordingly to body weight to reach the induction criteria i.e. loss of consciousness and loss of eyelid reflex; propofol in the dose of 3mg/Kg body weight ketamine in the dose of 0.5mg/Kg body weight and fentanyl in the dose of 1.0 μg/Kg body weight. The infusion rate of propofol for the maintenance of anaesthesia was 3mg/minute. The induction dose of propofol was less in group-I, 142.0±12.70 as compared to group-II, 155.0±18.89. Total dose of propofol was also less in group-I, 223.0±10.20 as compared to in group-II, 236.0±12.22. Number of top ups of ketamine in group-I was less than the number of top-ups of fentanyl in group-II. This could have been because when propofol and ketamine were used in combination, additive at hypnotic and anaesthetic end points.
The doses were almost similar and findings are in agreement with the work of Guit JBM et al (1990), Robertk Stoelting (1999), Sicignano A et al (1990), Hui TW et al (1995). Hamdani GA et al (1999) used ketamine in a dose of 0.3mg/Kg and was thought to be inadequate to provide sufficient analgesia for the surgical stimulus. They used propofol in dose of 2mg/Kg body weight and fentanyl 1.0μg/Kg body weight. Saha K et al (2001) use ketamine in the dose of 0.5mg/Kg body weight and fentanyl in the dose of 1.5μg/Kg body weight and found that dose of propofol for induction of anaesthesia with ketamine was less as compared with fentanyl.

Following administration of propofol and fentanyl i.e. group-II there was highly significant fall (p<0.001) in mean pulse rate at 1 minute, 5 minutes and 10 minutes after induction from pre-induction value as compared to in group-I where there is no significant fall in mean pulse rate after induction. This may be because ketamine causes some degree of sympathetic stimulation, which tends to counter balance, the cardiovascular effects of propofol. The findings are in agreement with the studies of Schuttler J et al (1991), Mayer M et al (1990) and Hernandez C et al (1999). Saha et al, found reduction in pulse rate after 5 and 10 minutes after induction with propofol & fentanyl.
Fall in systolic blood pressure was highly significant in group-II at 1, 5 and 10 minutes after induction from premedication value as compared to in group-I where there was no significant change after induction.

In group-I there was no significant change in diastolic blood pressure as compared to in group-II as there was highly significant fall (p<0.001) at 1 and 5 minutes and fall was significant (p<0.05) at 10 minutes after induction from pre-induction value.

In group-I there was no significant change in mean arterial pressure after induction as compared to in group-II where there was highly significant fall (p<0.001) at 1 and 5 minutes and fall was significant (p<0.05) at 10 minutes after induction from pre-induction value. These findings are consistent with the work of Schuttler J et al (1991), Mayer M et al (1990) and Hernandez C et al (1999).

The intra-operative haemodynamic variables were found to be reasonably stable in group-I, this may be because of the counter balancing the cardiovascular effects of propofol by ketamine, which causes some degree of sympathetic stimulation. Patients in group-II showed a significant fall in haemodynamic variable which could be
because of the additive cardiodepressant effects of propofol and fentanyl.

In group-I there was no significant change in respiratory rate after induction while in group-II there was significant fall in respiratory rate at 1 minute after induction from pre-induction value. This fall may be because of respiratory depression produced by fentanyl. The findings are in agreement with Mayer Me et al (1990) and Hernandez C et al (1999) and Sternlo JB, et al (1998) found respiratory depression after total intravenous anaesthesia with propofol and alfentanil.

Arterial oxygen saturation readings in both the groups had not shown any significant changes after induction from pre-induction values.

In present study, the recovery time i.e. patients fully conscious and oriented to time, place and person in group-I (5.0±1.57) was longer than in group-II (3.6±1.99) and the difference was statistically significant. The prolonged recovery time in group-I could be because of longer elimination half life of ketamine as compared to fentanyl Janstrup M et al (1990), Hamdani GA et al (1999), Saha K et al (2001) have the same opinion about the recovery time
i.e. prolonged with propofol and ketamine combination than the propofol and fentanyl combination.

Post-operatively, analgesic for post-operative pain relief was required by 1 patient (1.66%) in group-I and by 4 patients (6.66%) in group-II. This may be because in fentanyl group analgesia was still inadequate as compared to ketamine group. The findings are in consistent with the work of Mayer M et al (1990).

In present study pain on injection was experienced by 9 patients (15%) in group-II during propofol injection as compared to none in group-I. In group-II pain on propofol injection may be due to alkaline nature of solution and more frequent when small veins are used for induction. In group-I no pain on propofol injection may be due to the local anaesthetic action of ketamine when administered intravenously as well as the central analgesic effect. This was in agreement with the findings of Tan CH et al (1998).

In present study episodes of desaturation occur in 1 patient (1.66%) in group-II as compared to none in group-I. Fentanyl causes alteration in arterial oxygen saturation as observed by Pan PH, James CF (1994).

Apnoea had occurred in 1 patient (1.66%) in group-I as compared to none in group-II. This may be due to
respiratory depressant action of fentanyl, this findings is consistent with the Adams AP, Pybus DA (1978).

Nausea and vomiting was found in 4 patients (6.66%) in group-I and none in group-II. As propofol posses significant antiemetic activity the presence of nausea and vomiting in group-II may be due to fentanyl at analgesic doses by stimulating chemoreceptor trigger zone. This is also comparable with the vomiting observed with the work of Badner NH, Bhandari R, Komer WE (1994). Propofol has been used successfully to treat post-operative nausea vomiting in abolus dose of 10mg by Borgert A et al (1992).

Dreams and emergence delirium was found in 1 patient (1.66%) in group-I as compared to none in group-II. Therefore in the present study propofol also seems to be effective in eliminating the adverse emergence reaction of ketamine in sub anaesthetic doses. This findings is consistent with the work of Guit JBM et al (1990) that propofol has proved to eliminate this adverse emergence reaction associated with ketamine.

Acceptance of induction phase was good in 15 patient (28.33%), satisfactory in 12 patients (20%) and 1 patient (1.66%) complained about bad experience and 2 patient
(3.33%) could not say in group-II. This comparison of acceptance is entirely subjective.

In group-I acceptance of anaesthesia was good in 17 patient (28.33%) satisfactory in 10 patient (16.66%) and bad in 1 patient (1.66%) and 2 patient (3.33%) could not tell.

Compared to patients of group I, patients of group-II remains sedated for prolonged period after surgery although they are arousable.

Thus it appears that combination of propofol and ketamine in total intravenous anaesthesia gives better haemodynamic stability during induction and maintenance of general anaesthesia, when compared with the use of propofol and fentanyl in combination, superior analgesia with less respiratory depression. However one of the main drawback with ketamine anaesthetic has been the emergence reaction, in the present study propofol also seems to be effective in eliminating the adverse emergence reaction of ketamine in subanaesthetic doses.