

## Risk of hypoxia during flexible upper GI endoscopy in unsedated patients of a tertiary care public sector hospital in Karachi, Pakistan

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### ABSTRACT

**Objectives:** To measure the changes in oxygen saturation using pulse oximetry during flexible upper gastrointestinal endoscopy in unsedated patients.

**Methodology:** This is an observational study conducted on 356 patients undergoing unsedated upper gastrointestinal Endoscopy, during April 2009 to January 2010. Complete demographic data, systemic history, smoking history, laboratory evaluation and American Society of Anesthesiologists Physical Status (ASA-PS) were recorded in all patients. Patients with severe systemic disease (ASA-PS III-VI), those who needed emergency endoscopy and with anemia of hemoglobin <8gm/dl were excluded from the study.

**Results:** Out of 356 patients 186 (52.2%) were male and 170 (47.8%) were female. All the patients tolerated the procedure well at the start and at the end and had no oxygen desaturation. At mid of the procedure 21 (5.9%) patients showed mild oxygen desaturation and 4 (1.1%) showed moderate oxygen desaturation while 331 (93%) showed no oxygen desaturation. No patient at any stage showed severe oxygen desaturation. Relationship of smoking, co-morbidity and clinical signs with mid procedure oxygen saturation is insignificant in both genders.

**Conclusion:** It is concluded that mild to moderate hypoxia is some what common during therapeutic endoscopic procedure and of no serious consequence. However, severe hypoxia is not recorded in our study. The unsedated gastrointestinal endoscopy is a safe procedure for the diagnostic purpose, as it does not produce hypoxia during this; therefore pulse oximetry is not a precondition in patients undergoing unsedated diagnostic endoscopy without severe systemic disease. We recommend monitoring through pulse oximetry in patients with age greater than 45 years and procedure longer than 8 minutes.

**KEY WORDS:** Endoscopy, Oxygen desaturation, Pulse oximetry.

Pak J Med Sci October - December 2010 Vol. 26 No. 4 909-913

### How to cite this article:

Usman A, Jamal Q, Siddiqui AR, Pervez S, Pervez J, Durrani A. Risk of hypoxia during flexible upper GI endoscopy in unsedated patients of a tertiary care public sector hospital in Karachi, Pakistan. Pak J Med Sci 2010;26(4):909-913

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- \* Received for Publication: June 29, 2010 \*
- \* Revision Received: August 30, 2010
- \* Revision Accepted: September 1, 2010

### INTRODUCTION

Upper gastrointestinal endoscopy is extensively and commonly used for the analysis of patients with gastrointestinal symptoms. It has an important role in diagnosis and management of several diseases related to proximal GI tract, since the introduction of first panendoscope in 1963 by Hirschowitz.<sup>1</sup> Endoscopy is safe procedure with very low mortality of only one per 20,000 among sedated

procedures.<sup>2</sup> However it is associated with cardiopulmonary complications in which more than 50% are mainly due to intravenous sedation<sup>3</sup> and other factors airway obstruction obesity advanced age systemic illness.<sup>4,5</sup> Prolong desaturation can compromise cardiac and nervous system functioning.

The complication rate is about 0.1% for upper GI and 0.2% for lower GI endoscopy procedures.<sup>6-8</sup> Monitoring of cardiopulmonary parameters including pulse, blood pressure and pulse oximetry, helps in identifying and reducing the incidence and severity of complications.<sup>9,10</sup> Upper GI endoscopy without sedation is common practice in Asia<sup>11</sup> and studies have shown that it is safe and less expensive outpatient procedure.<sup>12,13</sup> Majority of upper GI endoscopy done for diagnostic purposes<sup>14</sup> and suited without sedation since brief examination is required in, out patient setting.

The objective of the study was to measure the change in oxygen saturation by using pulse oximetry during flexible upper gastrointestinal endoscopy in unsedated patients and to identify risk factors causing desaturation in those patients.

## METHODOLOGY

This is an observational study conducted on 356 patients undergoing unsedated upper gastrointestinal endoscopy in the endoscopy suit of department of medicine, Abbasi Shaheed hospital, Karachi, during April 2009 to January 2010. Complete demographic data, co-morbidities including diabetes, high blood pressure, Ischemic Heart Disease (IHD), asthma; and chronic obstructive pulmonary disease (COPD), Smoking history, Hemoglobin (Hb) levels, Prothrombin time (PT/INR), Hepatitis profile, blood sugar levels and American Society of Anesthesiologists Physical Status (ASA-PS)<sup>15</sup> were recorded in all patients.

**Exclusion criteria:** Patients with severe systemic disease (ASA-PS III–VI),<sup>15</sup> those who needed emergency endoscopy and those with anemia of hemoglobin (Hb) < 8gm/dl were excluded because anemic patients are more prone to desaturation in case of any bleeding. Indications for the endoscopy included abdominal pain, unexplained anaemia, dyspepsia, dysphagia, history of haematemesis, nausea, reflux symptoms, vomiting and weight loss. After taking written informed consent and explaining procedure to the patients, all were advised of having over night fasting. Before the procedure 4% lidocaine spray was administered to the pharyngeal area. Patients were examined in the left lateral position using Olympus endoscope with outer diameter of

9.2 mm. The endoscope was introduced per-orally into the oesophagus under direct vision. The oesophagus was carefully examined; and in case of grade four varices band ligation was done without further negotiation.

The stomach was viewed both antegrade and retrograde. After examination of the first and second parts of the duodenum, biopsies were taken of relevant lesions or from the gastric antrum to check for *Helicobacter pylori* infection, where indicated. SpO<sub>2</sub> levels were continuously monitored by a resident using a GMBH 78352C pulse oximeter (Hewlett Packard, Palo Alto, Calif., USA). SpO<sub>2</sub> was recorded at baseline when steady state was achieved, at the introduction of endoscope, after every minute so that mid procedure (taken as the mean of total endoscopy time) maximum (equal to baseline) or minimum (drop from baseline) level can be obtained and 30 seconds post endoscopy. Oxygen desaturation is categorized into four groups, which are: No desaturation (0% - 2% drop from baseline), mild desaturation (3% - 6% drop from baseline), moderate desaturation (7% - 9% drop from baseline) and severe desaturation (>9% drop from baseline). The total endoscopy time (from intubation to endoscope removal) was also recorded. No sedation was given throughout the procedure. The analysis was performed using SPSS version 16.0. Data expressed as mean ± SD. Paired "t" test was applied to prove the efficacy of result. All p-values were two sided and considered statistically significant if < 0.05.

## RESULTS

Out of 356 patients who fulfilled our inclusion criteria, 186 (52.2%) were male and 170 (47.8%) were female. Mean age of male patients was 38.31 ± 14.12 years and mean age of female patients was 35.64 ± 12.44 years. Mean age of both male & female was marginally significant (0.060).

All the patients tolerated the procedure well both at the start as well as at the end of the procedure and all 356 (100%) patients had no oxygen desaturation (0% - 2% drop from the baseline) while at mid of the procedure (taken as the mean of total endoscopy time), 21 (5.9%) patients showed mild oxygen desaturation (3% - 6% drop from baseline), 4 (1.1%) showed moderate oxygen desaturation (7% - 9% drop from baseline) while 331 (93%) showed no oxygen desaturation. No patient at any stage showed severe oxygen desaturation (>9% drop from baseline).

Regarding the smoking status of the patients, 74 (40%) male and all 170 (100%) female were found non-smokers, while 112 (60%) male gave the history

Table-I: Relation of co-morbidity with mid procedure oxygen saturation among male and female.

S.#	Co-Morbidity	Gender	Oxygen Desaturation			
			No Desaturation (0% - 2% drop from baseline)	Mild Desaturation (3% - 6% drop from baseline)	Moderate Desaturation (7% - 9% drop from baseline)	Severe Desaturation (>9% drop from baseline)
1	No Co-Morbidity	Male	130 (94.2%)	8 (5.8%)	0 (0%)	0 (0%)
		Female	144 (96%)	2 (1.3%)	4 (2.7%)	0 (0%)
2	HBV	Male	4 (100%)	0 (0%)	0 (0%)	0 (0%)
		Female	4 (100%)	0 (0%)	0 (0%)	0 (0%)
3	HCV	Male	18 (100%)	0 (0%)	0 (0%)	0 (0%)
		Female	8 (100%)	0 (0%)	0 (0%)	0 (0%)
4	Diabetes	Male	2 (50%)	2 (50%)	0 (0%)	0 (0%)
		Female	2 (50%)	0 (0%)	0 (0%)	0 (0%)
5	Hypertension	Male	10 (71.4%)	4 (28.6%)	0 (0%)	0 (0%)
		Female	0 (0%)	0 (0%)	0 (0%)	0 (0%)
6	DM & HTN	Male	6 (75%)	2 (25%)	0 (0%)	0 (0%)
		Female	2 (33.3%)	4 (66.7%)	0 (0%)	0 (0%)

of smoking. Mean duration of smoking was 18.3 + 9.3 years. Relationship of smoking status with mid procedure oxygen saturation among male and female was insignificant ( $p=0.15$ ). Among non-smokers, 70 (94.6%) male and 160 (94.1%) female showed no oxygen desaturation, while four (5.4%) male and six (3.5%) female showed mild oxygen desaturation. Moderate oxygen desaturation was found in only four (2.4%) female. In patients who gave the history of smoking, 100 (89.3%) males showed no oxygen desaturation and 12 (10.7%) male showed mild oxygen desaturation. No smoker showed moderate or severe oxygen desaturation.

No co-morbidity was found in 288 (81%) cases, while eight (2.2%) were infected from HBV, 26 (7.3%) had infected from HCV, six (1.86%) were diabetic, 14 (3.93%) were hypertensive and 14 (4%) had both

diabetes and hypertension. The relation of co-morbidity with mid procedure oxygen saturation among male and female was found insignificant. (Table-I) As far as the time is concerned, the mean time for endoscopy with biopsy was 10 minutes, mean time for endoscopy with banding was 12 minutes and the mean time for diagnostic endoscopy was eight minutes.

Regarding the relationship of biopsy with mid procedure oxygen saturation among male and female, 76 (92.7%) male and 70 (92.1%) female showed no oxygen desaturation, while in six (7.3%) male and two (2.6%) female mild oxygen desaturation was observed and four (5.3%) female showed moderate oxygen desaturation. In comparison with those patients, in which biopsy was not taken 89 (90.8%) male and 96 (96%) female showed no oxygen

Table-II: Relation of clinical signs with mid procedure oxygen saturation among male and female.

S.#	Clinical Sign	Gender	Oxygen Desaturation			
			No Desaturation (0% - 2% drop from baseline)	Mild Desaturation (3% - 6% drop from baseline)	Moderate Desaturation (7% - 9% drop from baseline)	Severe Desaturation (>9% drop from baseline)
1	No Clinical Signs	Male	92 (92%)	8 (8%)	0 (0%)	0 (0%)
		Female	62 (100%)	0 (0%)	0 (0%)	0 (0%)
2	Anemia	Male	22 (73.3%)	8 (26.7%)	0 (0%)	0 (0%)
		Female	30 (79%)	4 (10.5%)	4 (10.5%)	0 (0%)
3	Epigastric Tenderness	Male	56 (100%)	0 (0%)	0 (0%)	0 (0%)
		Female	68 (97.1%)	2 (2.9%)	0 (0%)	0 (0%)

desaturation, while nine (9.2%) male and four (4%) female showed mild oxygen desaturation. Regarding the relation of banding with mid procedure oxygen saturation among male and female, 14 (87.5%) male and four (100%) female showed no oxygen desaturation while two (12.5%) male showed mild oxygen desaturation.

Table-II shows the occurrence of clinical signs with mid procedure oxygen saturation among male and female.

## DISCUSSION

Unsedated endoscopy is performed in majority of the patients throughout the world.<sup>9</sup> In contrast with other studies like Hart R et al (0.1 % complications)<sup>5</sup>, Osinaike BB et al (no change in mean hemodynamic parameters)<sup>12</sup>, Silvis SE et al (2.3 % complications)<sup>16</sup>, no clinically significant cardiopulmonary complications were observed during this study. Only 7% of the patients showed mild to moderate oxygen desaturation while none of our patient showed severe oxygen desaturation. These are in contrast with Osinaike BB et al (12.5% severe)<sup>12</sup>, Javid G et al (15.8% severe)<sup>17</sup>, Dhariwal A et al (20% severe)<sup>18</sup>, Dark Ds et al (32 % severe).<sup>19</sup>

Our study have shown the similar results<sup>12,19-21</sup> that oxygen desaturation occurred in relation to the duration of the procedure and increasing age, as only 7.5% of the patients showed mild to moderate desaturation, who had undergone endoscopic examination with biopsy as well as banding and these cases were more than 45 years of age. However none of them required oxygen therapy as basal oxygen level was achieved in less than 30 seconds after endoscope was removed. Rana S et al<sup>22</sup>, reported in their study including 2015 cases, that in 94% of their cases, the upper GI endoscopy was well tolerated without pre-endoscopic sedation, and that the endoscopic procedure was performed more easily, we also found similar observations.

There are studies<sup>21,23,24</sup> which point out that smoking result in oxygen desaturation in both sedated and non-sedated cases; we found similar results as 10.7% of the patients showed mild desaturation only, which is clinically and statistically insignificant ( $p=0.15$ ). Mahdi<sup>21</sup> concluded that in unsedated endoscopy oxygen desaturation found in his study was related to anemia and we found quiet similar results as 4 (10.5%) anemic patients, who had Hb level less than 10 mg/dl, but more than 8 mg/dl, showed moderate desaturation. We recommend that those patients that have Hb less than 8 mg/dl may be monitored by pulse oximetry. The results of our

study are not unswervingly similar with those of Alcaín et al.,<sup>25</sup> since we particularly excluded patients with severe concomitant disorders, in addition to those attending for emergency procedures, ASA physical status<sup>15</sup> of greater than II and multiple intubation attempts. Our main finding was that moderate oxygen desaturation was an unusual event during routine unsedated diagnostic endoscopy. In addition, no one showed severe oxygen desaturation, indicating that patients without severe concomitant disease maintain SpO<sub>2</sub> levels.

It is concluded that mild to moderate hypoxia is some what common during therapeutic endoscopic procedure and of no serious consequence. However, severe hypoxia was not recorded in our study. The unsedated gastrointestinal endoscopy is a safe procedure for the diagnostic purpose, as it does not produce hypoxia; therefore pulse oximetry is not a pre-condition in patients undergoing unsedated diagnostic endoscopy without severe systemic disease. We recommend monitoring through pulse oximetry in patients with age greater than 45 years and procedure longer than eight minutes.

## ACKNOWLEDGMENT

The authors are extremely thankful & grateful to Professor Abu Noem Farooqui, Incharge Medical Unit-II, Department of Medicine, Karachi Medical & Dental College & Abbasi Shaheed Hospital, for his untiring efforts and useful guidance in every step of this study. We are really indebted to the precious support of Professor Farah Asad Mansuri. Thank are also due to Dr. Waseem Akhter, Dr. Furqan Shoaib Siddiqui, Dr. Nada Siddiqui, Dr. Mahnoor Khalil, Dr. Mohammad Nadeem and Mr. Rehan Malik for their valuable help and assistance.

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AU, QJ conceived, designed and did statistical analysis & final approval of manuscript. AURS, SP, JP, AD did data collection and manuscript writing.

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