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# International Journal of Advanced Research in Biological Sciences

ISSN: 2348-8069

www.ijarbs.com

DOI: 10.22192/ijarbs

Coden: IJARQG(USA)

Volume 5, Issue 7 - 2018

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## Research Article



DOI: <http://dx.doi.org/10.22192/ijarbs.2018.05.07.011>

## Time Needed to complete diagnostic gastrointestinal Endoscopy

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### Abstract

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**Background:**Gastrointestinal tract (G.I.T.) endoscopy is a commonly performed procedure in inpatient and outpatient settings.

**Aims:**The aim of this study is to estimate the approximate time needed to complete six different types of diagnostic endoscopy procedures, and this can help in time organization which helps in patient scheduling, endoscopy room staffing, physician and technical reimbursement, and sedation requirements.

**Study design and setting:**This study is a prospective study, the sample was randomly selected in Kurdistan Center of Gastroenterology and Hepatology in Sulaimani teaching hospital.

**Patients and Methods:**80 patients were selected randomly. The instruments used were the OLYPUS LUCERA CV-260 and the OLYPUS EXERA CLV-160 endoscopes. A stop watch was used to calculate the time from the start of insertion to the end of withdrawal of the endoscope.

**Results:**Significant differences in time appeared among the different diagnostic endoscopy procedures studied, the mean time for diagnostic upper endoscopy without biopsy was 1.9 min., the mean time for diagnostic upper endoscopy with biopsy was 5.7 min., the mean time for diagnostic colonoscopy with neither ileal intubation nor biopsy taking was 13.3 min., the mean time for diagnostic colonoscopy without ileal intubation but with biopsy taking was 22.8 min., the mean time for diagnostic colonoscopy with ileal intubation but without biopsy taking was 18.9 min., and the mean time for diagnostic colonoscopy that was with ileal intubation and biopsy taking was 24.5 min.

**Conclusions:**Significant differences in time appeared among the different diagnostic endoscopy procedures that were studied. Biopsy taking significantly prolonged time comparing to procedures that did not require biopsy taking. Ileal intubation significantly prolonged time in diagnostic colonoscopy procedures.

**Keywords:** G.I.T, Endoscopy, Biopsy

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## Acknowledgements

First of all ,I would like to express my special thanks and appreciation to Dr.Mohammad Shaikhaei for his valid guidance and supervision.

Im also thankful to Dr.Taha Al-Karbouli and all those who work in Kurdistan Center of Gastroenterology and Hepatology for their help and guidance.

Finally Im thankful to all those who have assisted me in preparing this study.

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## Table of Abbreviations

Abbreviation	
G.I.T.	Gastrointestinal tract
E.R.C.P.	Endoscopic retrograde cholangiopancreatography
E.U.S.	Endoscopic ultrasound
S.D.	Standard deviation
Min.	Minute
E.Q.	Efficiency quotient

## Introduction

Endoscopy is a medical procedure that involves viewing a body cavity, such as the stomach, with a fibro-optic cord-like instrument called an endoscope. Endoscopy uses cameras and video recorders to make permanent records of the appearance of internal organs. Endoscopy procedures may be diagnostic and/or therapeutic and are generally performed under a topical or general anesthesia. Most of the patients are outpatients. Esophagogastroduodenoscopy is an endoscopic examination of the esophagus, stomach, and duodenum (the first part of the small intestine). It is also called upper endoscopy. Colonoscopy is an examination of the entire length of colon, or large intestine, using an endoscope to detect early signs of cancer, inflamed tissue, abnormal growths, vascular malformations, ulcers and/or bleeding in the colon or rectum<sup>(1)</sup>.

Time to insert a gastrointestinal endoscope and total procedure time are important for several reasons: patient scheduling, endoscopy room staffing, physician and technical reimbursement, sedation requirements, and risk of sedation-related complications<sup>(2)</sup>.

The total procedure time involves the time from the entry of the patient, and then taking the consent of the patient, then the start and the end of the procedure, then the exit of the patient, then the performing of the paperwork, and then the arrival of new patient<sup>(3)</sup>.

These calculations are very useful to assess efficiency in the endoscopy unit and efficiency can be expressed as the efficiency quotient (E.Q.) which can be calculated from:

$$[\text{duration of endoscopic procedure} + \text{duration of post-procedure paperwork}] / [\text{total duration of patient in endoscopy suite} + \text{interval between successive patients entering the endoscopy suite}]^{(4)}$$

Using personnel to both consent and sedate the patient would reduce the median total procedure time for both esophagogastroduodenoscopy and colonoscopy.

Efficiency could be further enhanced by eliminating the need for the endoscopist to perform the post-procedure paperwork. The core competency of endoscopist is procedure performance, therefore the aim of the endoscopy process should be to maximize the time spent by the endoscopist performing procedures and minimize his or her need to perform all other tasks<sup>(4)</sup>.

Introducing a mechanism to eliminate the need for the endoscopist to perform paperwork (e.g. contemporaneous documentation, such as real-time data entry by the endoscopy assistant during procedure) would significantly spare a time for endoscopist activity for both esophagogastroduodenoscopy and colonoscopy<sup>(5)</sup>. Few studies have addressed the impact of endoscopist-specific parameters on colonoscopy duration. Increasing endoscopist experience level correlates with both speed of insertion and speed of withdrawal at colonoscopy<sup>(6)</sup>.

Successful colonoscopy depends on the insertion of the instrument to the cecum, a detailed examination, and minimal discomfort to the patient during the procedure<sup>(6)</sup>. Colonic spasm is a relatively common problem for endoscopist<sup>(6)</sup>. Although temporary, it may increase the difficulty of colonoscopy, make the procedure painful for the patient and may force the endoscopist to push the instrument further to see mucosa. Antispasmodic agents have been reported as both useful<sup>(14,15)</sup> and not useful<sup>(16,17)</sup> in relieving colonic spasms during colonoscopy. In addition, some endoscopists believe that using an antispasmodic may make endoscopy more difficult by actually decreasing the tone of colonic muscle. As a conclusion of previous study, antispasmodic drugs significantly reduces colonoscopic intubation time<sup>(18)</sup>.

It has been previously shown that tolerance of colonoscopy is directly related to the duration of the procedure<sup>(19)</sup>. In a study of Eckardt et al, the mean intubation time and duration of the total procedure (colonoscopy) were significantly longer in patients having vasovagal reactions compared to patients who experienced no complications<sup>(20)</sup>.

There is a positive correlation between patients degree or severity of pain and duration of time required to reach the cecum.

Looping and straightening of the colonoscope shaft and over insufflation are contributing factors for both prolongation of time and pain during the procedure and as the endoscopist gains experience ,these maneuvers gradually decrease and the procedure becomes less time-consuming and less painful<sup>(6)</sup>.

## Patients and Methods

This study is a prospective study conducted in Kurdistan Center of Gastroenterology and Hepatology in Sulaimani teaching hospital from 1-9-2009 to 15-5-2010. The instruments used were the OLYMPUS LUCERA CV-260 and the OLYMPUS EXERA CLV-160 endoscopes. Time was calculated from the start of insertion to the end of withdrawal of the endoscope. A stop watch was used to estimate the time in minutes. 80 patients of both sexes were selected randomly and 40 of them underwent diagnostic upper endoscopy and the other 40 underwent diagnostic colonoscopy. 30 of those with diagnostic upper endoscopy were with biopsy taking and the other 10 were without biopsy taking. 10 of those with diagnostic colonoscopy were neither with ileal intubation nor biopsy taking and 10 of them were without ileal intubation but with biopsy taking. The remaining 20 underwent diagnostic colonoscopy with ileal intubation, 10 of them were with biopsy and the other 10 were without biopsy. Inclusion criteria include any patient who underwent diagnostic upper endoscopy and any patient who underwent diagnostic colonoscopy. Exclusion criteria include any patient who underwent therapeutic endoscopy, sigmoidoscopy, E.R.C.P., E.U.S., patients with poor pre-procedure preparation, patients who could not tolerate the procedure till complete, and any colonoscopy procedure without cecal intubation.

## Results

The patients characteristics regarding their differentiation into age groups, their numbers in relation to these age groups, their numbers in relation to gender, and their numbers in relation to the smoking status are shown in Table 1.

Table 1 Patients numbers in relation to age groups, gender, and smoking status.

	Number	Percentage
<b>Age group</b>		
Less than 20	8	10.0
20-35	19	23.8
36-50	19	23.8
51-65	29	36.3
More than 65	5	6.3
<b>Gender</b>		
Male	37	46.3
Female	43	53.8
<b>Smoking status</b>		
Yes	15	17.7
No	65	82.3

The total numbers of patients with and without sedation are shown in Fig. 1.

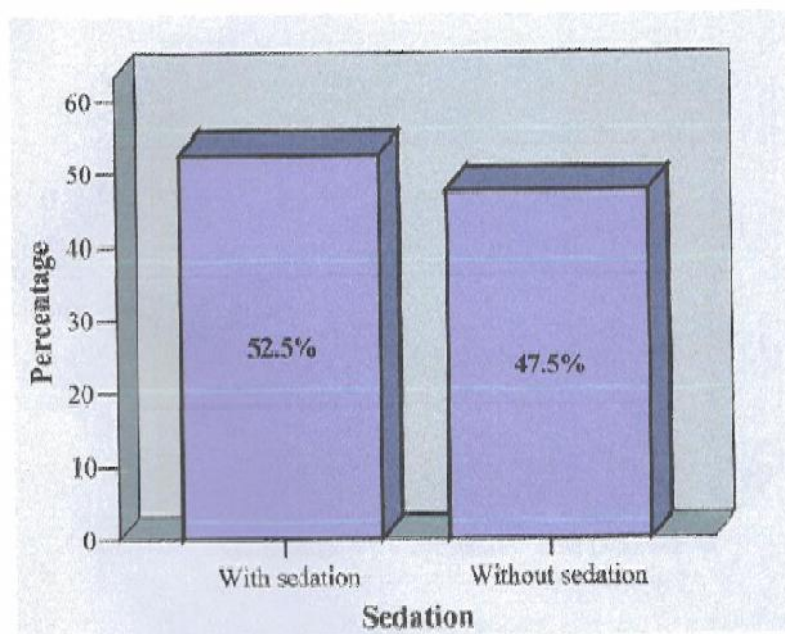


Fig.1 Total numbers of patients with and without sedation.



The types of sedation used were either medazolam only or pethidine only or both medazolam and pethidine and the numbers of patients who received sedation are shown in Fig.2

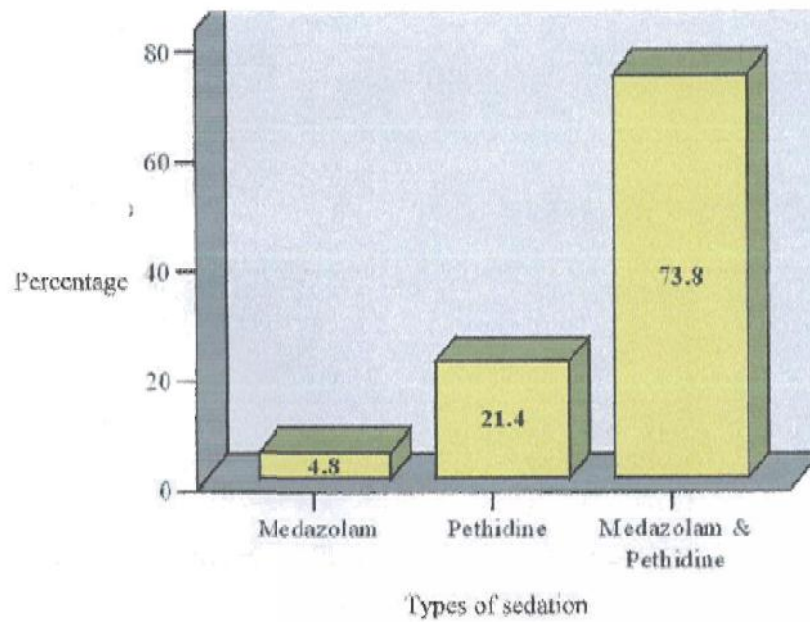


Fig.2 The numbers of patients who received sedation.

The total numbers of patients with normal and abnormal findings are shown in Fig.3.

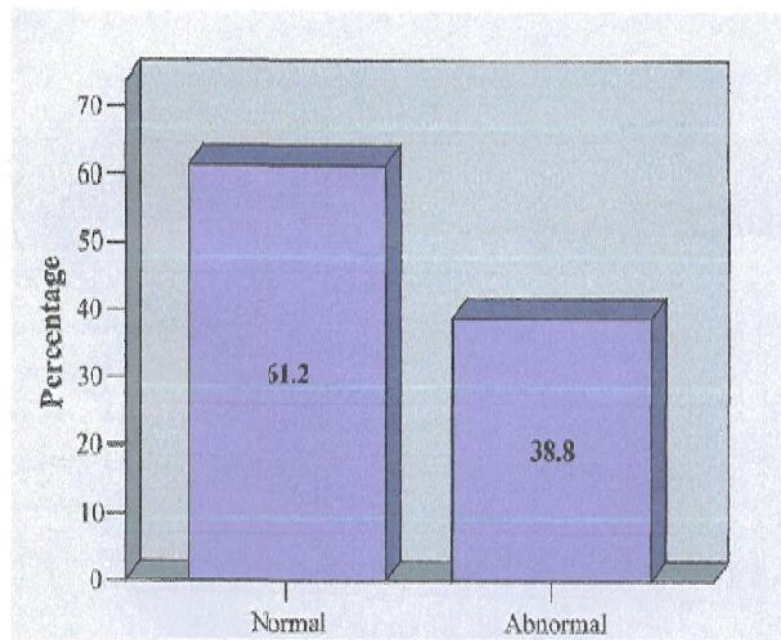


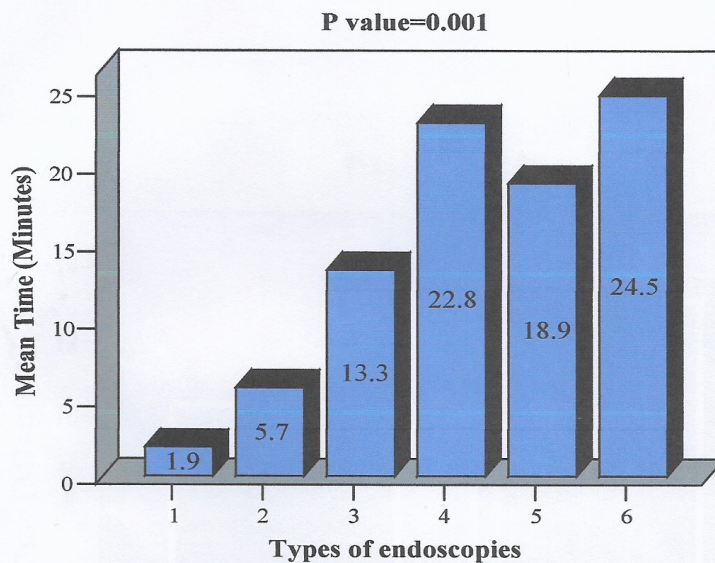
Fig.3 Total numbers of patients with normal and abnormal endoscopic findings.

There were statistically –significant differences in the age and time among the different endoscopic procedures,ANOVA test was used to calculate the P value(Table 2).

Table 2 Age(years) and Time(minutes) in each type of endoscopy.

Type of endoscopy	Age (Years) Mean $\pm$ S.D	Time (Minutes) Mean $\pm$ S.D
	P value=0.001	P value=0.001
Diagnostic upper endoscopy without biopsy.	36.5 $\pm$ 17.2	1.87 $\pm$ 0.9
Diagnostic upper endoscopy with biopsy.	35.6 $\pm$ 7.2	5.7 $\pm$ 1.3
Diagnostic colonoscopy without ileal intubation and without biopsy.	47.4 $\pm$ 17.1	13.3 $\pm$ 3.1
Diagnostic colonoscopy without ileal intubation and with biopsy.	54.7 $\pm$ 10.3	22.8 $\pm$ 4.1
Diagnostic colonoscopy with ileal intubation and without biopsy.	45.5 $\pm$ 15.9	18.8 $\pm$ 2.5
Diagnostic colonoscopy with ileal intubation and with biopsy.	53.8 $\pm$ 5.1	24.5 $\pm$ 2.6

The statistically-significant differences in the mean time(minutes) among the different types of endoscopic procedures involved are also shown in Fig.4,ANOVA test was used to calculate the P value.



- 1 means diagnostic upper endoscopy without biopsy.
- 2 means diagnostic upper endoscopy with biopsy.
- 3 means diagnostic colonoscopy neither with ileal intubation nor biopsy.
- 4 means diagnostic colonoscopy without ileal intubation but with biopsy.
- 5 means diagnostic colonoscopy with ileal intubation but without biopsy.
- 6 means diagnostic colonoscopy with ileal intubation and biopsy.

Fig. 4 Mean time (minutes) of the various types of endoscopies.



Regarding all the six different diagnostic endoscopy procedures involved, there was no statistically-significant difference in the mean time between procedures with normal findings from those with abnormal findings, t-test was used to calculate the P value (Fig. 5).

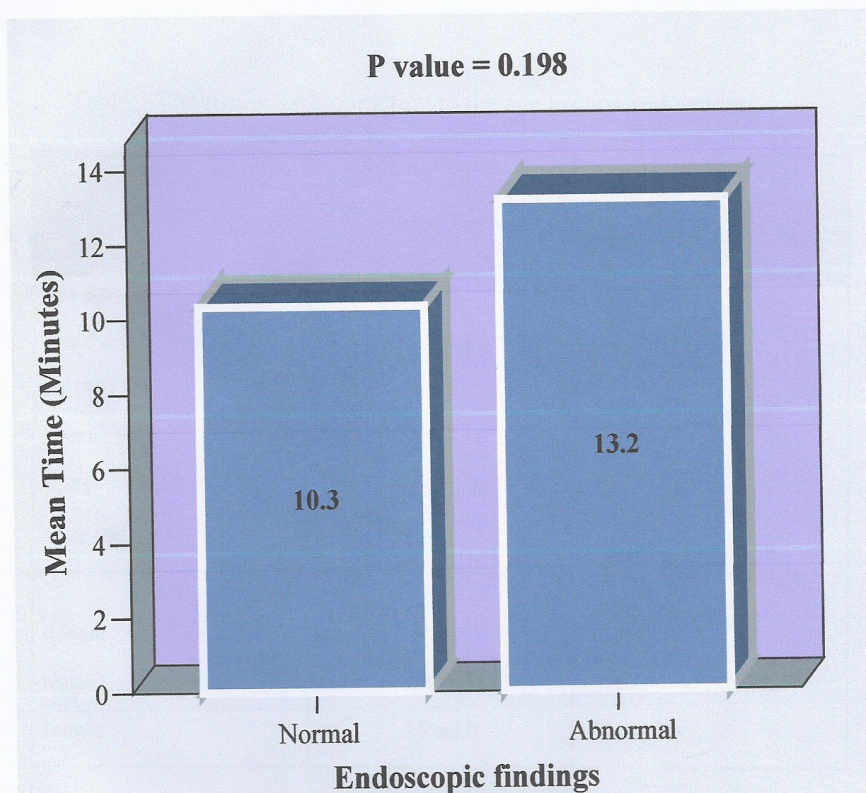


Fig.5 Mean time (minutes) of endoscopies with normal and abnormal findings.

Statistically-significant differences in time were found among the age groups(ANOVA test was used to calculate the P value) and no significant difference in time was found between male and female patients(t-test was used to calculate the P value) and as shown in Table 3.

Table 3 Time(minutes) in relation to the age groups and gender.

Variables	Time (Minutes)	P value
	Mean $\pm$ Std. Deviation	
<b>Age group</b>		
Less than 20	5.25 $\pm$ 6.25	<b>0.000</b>
20-35	6.95 $\pm$ 7.61	
36-50	9.11 $\pm$ 8.02	
51-65	17.62 $\pm$ 9.07	
More than 65	11.20 $\pm$ 11.3	
<b>Gender</b>		
Male	13.16 $\pm$ 9.2	0.132
Female	9.93 $\pm$ 9.6	

There was a significant difference in the mean time between diagnostic upper endoscopy procedures and diagnostic colonoscopy procedures as shown in Fig.6, t-test was used to calculate the P value.

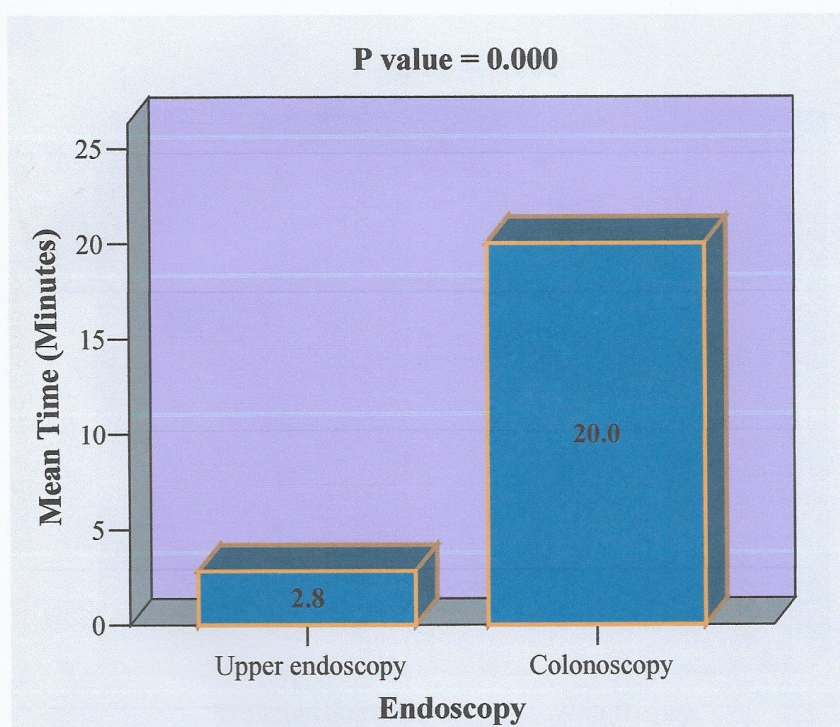


Fig.6 Mean time (minutes) of diagnostic upper endoscopy and colonoscopy procedures.



Among all procedures that were done without biopsy and those that were done with biopsy, there was a significant difference in the mean time with a longer mean time was found for those procedures that were done with biopsy (Fig. 7), t-test was used to calculate the P value.

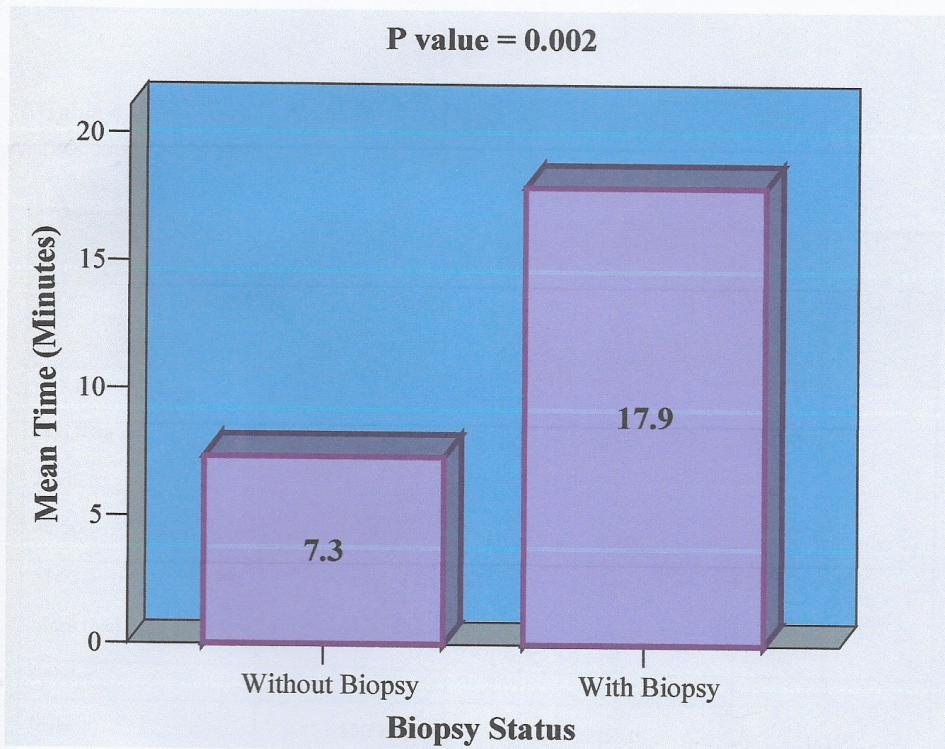


Fig.7 Mean time of diagnostic endoscopy procedures with and without biopsy.



The numbers of patients of diagnostic upper endoscopy and colonoscopy procedures varied significantly among the age groups, while there was no significant difference in the number of patients between males and females. Statistically-significant difference in the number of patients who required sedation was found between diagnostic upper endoscopy and diagnostic colonoscopy procedures and as shown in Table 4, Chi Square test was used to calculate the P value.

Table 4 Numbers of patients of diagnostic upper endoscopy and colonoscopy procedures in relation to age groups, gender, and sedation status.

Variable	Endoscopic Type		P value
	Upper Endoscopy N (%)	Colonoscopy N (%)	
<b>Age group</b>			
Less than 20	7(17.5)	1(2.5)	<b>0.001</b>
20-35	13(32.5)	6(15.0)	
36-50	12(30.0)	7(17.5)	
51-65	6(15.0)	23(57.5)	
More than 65	2(5.0)	3(7.5)	
<b>Gender</b>			
Male	15(37.5)	22(55.0)	0.156
Female	25(62.5)	18(45.0)	
<b>Sedation</b>			
Yes	3(7.5)	40(100.0)	<b>0.000</b>
No	37(92.5)	0(0.0)	

Significant difference in time was found between:

1-Diagnostic upper endoscopy procedures that were done without biopsy and those that were done with biopsy.

2-Diagnostic colonoscopy procedures that were done without ileal intubation but with biopsy taking and those that were done neither with ileal intubation nor biopsy taking.

3-Diagnostic colonoscopy procedures that were done with ileal intubation and biopsy taking and those that were done with ileal intubation but without biopsy taking.

4-Diagnostic colonoscopy procedures that were done without ileal intubation and those that were done with ileal intubation and as shown in Table 5, t- test was used to calculate the P value.

Table 5 Time of the various types of diagnostic endoscopies in relation to biopsy status and diagnostic colonoscopies in relation to ileal intubation status.

Variables	Time (Minutes)	P value
	Mean $\pm$ Std. Deviation	
Diagnostic upper endoscopies without biopsy.	1.87 $\pm$ 0.9	<b>0.000</b>
Diagnostic upper endoscopies with biopsy.	5.70 $\pm$ 1.3	
Diagnostic colonoscopies neither with ileal intubation nor biopsy	13.3 $\pm$ 3.1	<b>0.000</b>
Diagnostic colonoscopies without ileal intubation but with biopsy.	22.8 $\pm$ 4.1	
Diagnostic colonoscopies with ileal intubation but without biopsy.	18.8 $\pm$ 2.5	<b>0.000</b>
Diagnostic colonoscopies with ileal intubation and biopsy.	24.5 $\pm$ 2.6	
Diagnostic colonoscopies without ileal intubation.	18.05 $\pm$ 6.03	<b>0.018</b>
Diagnostic colonoscopies with ileal intubation.	22.00 $\pm$ 3.85	

## Discussion

In this study ,no statistically –significant difference in time was found between male and female patients and this contradicts other study that showed that time was significantly prolonged in female patients at colonoscopy <sup>(22)</sup> ,this contradiction occurred probably because of the presence of some factors that were not studied in the current study that probably can make significant difference in time between males and females.

Statistically- significant differences in time (in minutes) among the age groups were found.Knowing the patient from which age group can help the endoscopist to predict the time needed to complete the procedure and can help him in patient scheduling.No study was found addressing differences in time among such age groups.

Among the six types of procedures involved ,there were significant differences in the mean time found with the longest mean time found in diagnostic colonoscopy procedures that involved ileal intubation and biopsy taking (24.5 minutes) and the shortest mean time found in upper endoscopy procedures that did not involve biopsy taking (1.9 minutes).These results confirm a previous study that has shown that diagnostic upper endoscopy procedures take shorter time than diagnostic colonoscopy procedures ,2.1 minutes for the diagnostic upper endoscopy and 18.2 minutes for the diagnostic colonoscopy <sup>(23)</sup>. These results can in turn help the endoscopist to organize and predict the time of each procedure and can help him to estimate his daily procedure volume and sedation requirements.

Significant difference in time appeared between upper endoscopy procedures and colonoscopy procedures and this also confirms the previous above mentioned study<sup>(23)</sup>.

The numbers of patients with diagnostic upper endoscopy procedures varied significantly among the age groups with the highest numbers found in age groups 20-35 years and 36-50 years ,13(32.5%) and 12(30.0%) respectively,and the number was the lowest at the age group which was more than 65 years which was 2(5.0%).The numbers of those who underwent diagnostic colonoscopy procedures in this study also have shown significant differences among the age groups where the highest numbers found in age groups 51-65 years and 36-50 years ,23(57.5%)

and 7(17.5%) respectively ,and the number was the lowest at the age group which was less than 20 years which was 1(2.5%),no study was found addressing such differences.The number of patients who needed sedation was significantly higher in those with diagnostic colonoscopy procedures and this confirms a study of Bell GD, which showed that colonoscopy procedures require more sedation than upper endoscopy procedures<sup>(10)</sup>.

The diagnostic upper endoscopy procedures that have involved biopsy taking significantly needed more time than those with no biopsy taking.The diagnostic colonoscopies that were without ileal intubation but with biopsy also needed more time than those that were neither with ileal intubation nor biopsy and the diagnostic colonoscopies that have involved ileal intubation also consumed more time when there was biopsy taking and as a result biopsy taking in the all six types of procedures involved significantly have prolonged them and this is a logical result in regard to the time consumed by biopsy taking.

A statistically-significant difference in time appeared between diagnostic colonoscopy procedures that involved ileal intubation from that procedures that did not involve ileal intubation. This finding is in concordance with a previous study concluding that ileal intubation prolongs the time needed for colonoscopy without diagnostic benefit of routine ileoscopy <sup>(24)</sup>.

In all these six different diagnostic endoscopy procedures, no significant difference in the mean time was found between procedures with normal findings from those with abnormal findings ,this contradicts the study of Kim WH et al,which showed significant difference in time between colonoscopies with normal findings from colonoscopies with abnormal findings where the results of that study were:20.1 minutes for those with abnormal findings and 13.2 minutes for those with normal findings <sup>(2)</sup>,this contradiction occurred probably because of the different nature of abnormalities that were seen in both studies.

## Conclusions

Statistically-significant differences in the mean time (in minutes) among the six different diagnostic endoscopy procedures studied were noticed. Biopsy taking significantly prolonged all the diagnostic endoscopy procedures studied and ileal intubation significantly prolonged the diagnostic colonoscopy procedures studied. Statistically-significant differences in time among the various age groups were found and significant difference in time was found between diagnostic upper endoscopy procedures and diagnostic colonoscopy procedures and statistically-significant difference in the number of patients who required sedation was found between those with diagnostic upper endoscopy procedures and those with diagnostic colonoscopy procedures.

## Recommendations

It is recommended that other endoscopic procedures such as E.R.C.P.,E.U.S.,and all therapeutic endoscopy procedures should undergo a same study .The total procedure time from the entry of the patient , then taking the consent of the patient,then the start and the end of the procedure,then the exit of the patient ,then the performing of the paperwork,and then the arrival of new patient should be estimated in future studies to allow evaluation of the efficiency in the endoscopy unit.

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## Time needed to complete diagnostic gastrointestinal endoscopy: The questionnaire used

-Patient 's code number:

-Age:            years.

-Smoker:No

                 Yes                    ,if (Yes) then    Pack/day:                    ,and duration:

-Gender: Male

                 Female

-Sedation:No

                 Yes                    , if (Yes) then    Type:Medazolam

   Pethidine

-Time needed to complete the procedure:                    minutes.

-Diagnostic upper endoscopy without biopsy.

-Diagnostic upper endoscopy with biopsy.

-Diagnostic colonoscopy neither with ileal intubation nor biopsy.

-Diagnostic colonoscopy without ileal intubation but with biopsy.

-Diagnostic colonoscopy with ileal intubation but without biopsy.

-Diagnostic colonoscopy with ileal intubation and biopsy.

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DOI: <a href="https://doi.org/10.22192/ijarbs.2018.05.07.011">10.22192/ijarbs.2018.05.07.011</a>	

How to cite this article:

Ali Faik Fadhil. (2018). Time Needed to complete diagnostic gastrointestinal Endoscopy. Int. J. Adv. Res. Biol. Sci. 5(7): 127-159.

DOI: <http://dx.doi.org/10.22192/ijarbs.2018.05.07.011>