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Original Research Article

AIRWAY FOREIGN BODIES IN PATIENTS THAT UNDERWENT BRONCHOSCOPIES WITH GENERAL ANESTHESIA IN DR. SOETOMO GENERAL ACADEMIC HOSPITAL SURABAYA

Annisa Maya Sabrina[1a], Maulydia[2], Rizka Fathoni Perdana[3], Mariza Fitriati[2]

[1] Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia

[2] Department of Anesthesiology and Reanimation, Faculty of Medicine, Universitas Airlangga/Dr. Soetomo General Academic Hospital, Surabaya, Indonesia

[3] Department of Otorhinolaryngology and Head-Neck, Faculty of Medicine, Universitas Airlangga/Dr. Soetomo General Academic Hospital, Surabaya, Indonesia

[a] Corresponding author: annisa.maya.sabrina-2018@fk.unair.ac.id

ABSTRACT

Introduction: Airway foreign body (AFBs) is the most common emergency for ENT-HN (Ear, Nose, Throat-Head Neck) that requires immediate treatment. The gold standard management for AFBs is a bronchoscopy performed under general anesthesia (GA)**. Objective:** This study aims to determine the profile of AFBs patients who underwent bronchoscopies with GA at Dr. Soetomo General Hospital Surabaya from January 2018 – December 2019. **Methods:** This is a descriptive, retrospective study that uses data from medical records. Microsoft Excel was used to analyze the data. 22 patients met the inclusion criteria. **Results:** The most common ages were 11 to 20-year-olds (73%), 55% were female, and 45% were male. The patients were from outside (73%) and inside (27%) Surabaya. As much as 67% of the sampled patients had coughs and 23% were symptomless. The foreign bodies found were pins (67%), clipboard nails (14%), and nuts (9%). These AFBs were located in the left main bronchus (45%), trachea (32%), and right main bronchus (18%), and in 5% of these cases, the AFBs could not be located. The duration between the event and the bronchoscopy was mostly less than 1 day (54%), 2 days (32%), and 3 days (14%). Most cases (90%) were without AFBs complications, but some had obstruction (5%), and hemoptysis (5%). Most patients also had an uncomplicated bronchoscopy (81%), however, some suffered lesions (14%) and bleeding (5%). A majority of the patients were also ASA I (68%), and the remainder were classified as ASA II (18%), and III (14%). The premedication drugs administered were fentanyl (41%), and a combination of fentanyl and midazolam (41%). Meanwhile, the most frequently maintained anesthetic agent was Isoflurane+O_2 (27%). Most patients also did not have any comorbid factors (85%), but some had anemia (5%), obstruction (5%), as well as obesity followed by sputum retention and hypernatremia (5%). **Conclusion:** Most AFB patients who underwent bronchoscopy under GA were 11-20 years old, female, and had a cough as a clinical symptom. Most AFBs were pins at the left main bronchus. The duration between the incident and the bronchoscopy was less than 1 day. There were also mostly no complications of AFBs and bronchoscopies. The most common physical status in patients was ASA I, with fentanyl only or fentanyl and midazolam as a premedication drug. The most common agent used to maintain the anesthesia was a combination of isoflurane and O_2. Most patients also had no comorbid factors for GA.

Keywords: AFBs; Bronchoscopy; General Anesthesia; Good Health and Well Being; Profile; Sociodemography

ABSTRAK

Pendahuluan: Benda asing saluran napas **(**BASN) merupakan kegawatdaruratan tersering pada THT-KL yang memerlukan penanganan segera. Bronkoskopi adalah *gold standard* untuk tatalaksana BASN yang lebih baik dilakukan dibawah anestesi umum. **Tujuan:** Penelitian ini bertujuan untuk mengetahui profil dan tatalaksana penderita BASN yang menjalani bronkoskopi dengan anestesi umum di RSUD Dr. Soetomo Surabaya Periode Januari 2018 – Desember 2019. **Metode:** Penelitian ini merupakan penelitian deskriptif retrospektif, menggunakan data rekam medis dan dianalisis dengan Microsoft Excel. Didapatkan 22 penderita yang memenuhi kriteria inklusi. **Hasil:** Kelompok usia terbanyak adalah 11-20 tahun (73%),55% perempuan dan 45% laki-laki. Penderita berasal dari luar (73%) dan dalam (27%) Surabaya. Batuk ditemukan pada (67%) penderita, sedangkan 23% tanpa gejala. BASN berupa peniti (67%), paku *clipboard* (14%), dan

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kacang (9%). Lokasi: bronkus utama kiri (45%), trakea (32%), bronkus utama kanan (18%), dan tidak ditemukan (5%). Durasi kejadian sampai bronkoskopi paling banyak <1 hari (54%), 2 hari (32%), dan 3 hari (14%). Terdapat (90%) tanpa komplikasi BASN, namun sebagian mengalami obstruksi (5%), dan hemoptisis (5%). Sebagian besar tanpa komplikasi bronkoskopi (81%), tetapi beberapa mengalami lesi (14%), dan perdarahan (5%). Didapatkan ASA penderita, ASA I (68%), II (18%), dan III (14%). Obat premedikasi yang paling sering digunakan adalah fentanil (41%), dan kombinasi fentanil+midazolam (41%). Obat *maintenance* yang paling sering digunakan adalah Isoflurane+O_2 (27%). Sebagian besar penderita tanpa faktor penyerta (85%), tetapi beberapa mengalami anemia (5%), obstruksi (5%), juga obesitas diikuti dengan retensi sputum dan hipernatremia (5%). **Kesimpulan:** Sebagian besar penderita BASN yang menjalani bronkoskopi di bawah anestesi umum berusia 11-20 tahun, berjenis kelamin perempuan, dengan gejala klinis batuk. Sebagian besar BASN berupa peniti dan lokasinya di bronkus utama kiri. Durasi kejadian sampai bronkoskopi adalah <1 hari. Sebagian besar tidak mengalami komplikasi BASN dan bronkoskopi. Status fisik ASA I adalah yang paling umum, fentanil atau kombinasi fentanil+midazolam sebagai obat premedikasi. Sebagian besar obat *maintenance* adalah kombinasi isofluran dan O_2, dan tidak memiliki faktor komorbiditas untuk anestesi umum.

Kata Kunci: BASN; Bronkoskopi; Anestesi umum; *Good Health and Well* Being; Profil; Sosiodemografi

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INTRODUCTION

Airway foreign bodies (AFBs) or foreign body aspirations, is the entry of objects originating from outside or inside the body into the respiratory tract. AFBs are one of the most common emergencies in the field of ENT-HN that requires immediate treatment (1). Delay in treatment can increase the occurrence of complications and even death. The type of AFBs can vary, and this is influenced by geography, food variations, and the environment. AFBs can be in the form of organic or non-organic materials. A common organic material for AFB is peanuts (2).

AFBs are reported to occur in children worldwide. As high as 80% of cases occur at the age of under 3 years old with a peak at the age of 1-2 years. The incidence is 0.6 cases per 100,000 children and boys have a higher incidence partly due to their more impulsive characteristics (3). The most common location for AFBs is in the right bronchus. The right main bronchus in adults is shorter than the left main bronchus and forms a 25^o angle from the median line, while the left main bronchus forms a 45^o angle. The right main bronchus almost forms a straight line with the trachea, so foreign objects from outside can easily enter the right bronchus compared to the left (4).

During 2013-2017, there were 92 patients with AFBs at Hasan Sadikin Hospital in Bandung. The AFBs were found in the trachea (18.47%), the right bronchus (51.08%), and the left bronchus (30.43%) (2). Twenty AFBs patients underwent bronchoscopy in 2012-2016 at Dr. Mohammad Hoesin Hospital Palembang. Based on gender, there were 9 male and 11 female patients. The age distribution was 6 months-60 years. The most common age group of AFB patients was children between 6 months to 13 years old, with as many as 18 patients in that age range. Meanwhile, there was also one 43-year-old and one 60-year-old patient too (5).

Diagnosis and therapy are important for preventing mortality and complications in these types of cases. On-time and accurate diagnosis, as well as the safe removal of foreign bodies, are also crucial. The diagnosis is made based on history, physical examination, and radiological examination. Rigid bronchoscopy is the main choice in the management of AFBs (5).

Bronchoscopies can be performed under GA. GA is relatively safer and more convenient than local anesthesia. The bronchoscopy procedure causes manipulation of the airway,

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therefore a safe anesthetic method is needed to maintain good oxygenation and stable hemodynamics with minimal complications (6). Nevertheless, the success of the AFB extraction with GA is strongly influenced by the availability of tools and abilities, as well as the experience of the doctor or operator. To the extent that the availability of tools, abilities, and experience of qualified doctors, can minimize death caused by AFBs under GA. Therefore, this study was conducted to analyze general data on AFB patients, their clinical symptoms, type and location of AFBs, duration between events to bronchoscopy procedure, AFBs and bronchoscopy complications, the patients' ASA physical status, premedication drugs, maintenance drugs, and factors that affect anesthesia (comorbidities). The data obtained from this study can serve as a reference for general anesthesia procedures in AFB bronchoscopy procedures.

MATERIALS AND METHODS

This is a descriptive retrospective study that uses data from medical records. The data consists of sociodemographic characteristics, clinical symptoms, type of AFBs, location of AFBs, duration of events until bronchoscopy, AFB complications, bronchoscopy complications, ASA physical status, premedication drugs, maintenance drugs, and comorbid factors for GA of AFB patients who underwent bronchoscopies with GA in Dr. Soetomo General Hospital Surabaya from January 2018 to December 2019. A total of 22 samples met the inclusion criteria, namely patients with AFBs who underwent bronchoscopy with GA in Dr. Soetomo General Hospital Surabaya from January 2018 to December 2019 and had a complete medical record. This study used the total sampling method.

The data were analyzed with Microsoft Excel and presented in a distribution frequency table and then turned into a descriptive form. This study was approved by the ethics committee of Dr. Soetomo General Hospital Surabaya (0237/LOE/301.4.2/XII/2020).

RESULTS AND DISCUSSION

This study found 24 patients with AFBs who underwent bronchoscopies under GA, but two of them were excluded because of incomplete data. Thus, a total of 22 patients were included. The majority of patients were in the 11 to 20 years age group (73%), followed by the 0-10 years age group (22%), and the 21-30 years age group (5%). As much as 55% of the patients were female and 45% were male. The patients came from outside (73%) and inside (27%) Surabaya. The patients' sociodemographic distribution is shown in **Table 1.**

Table 1. Sociodemographic of Patients

Sociodemographic	N (%)
Age (years)	
0-10	5 (22)
11-20	16 (73)
21-30	1 (5)
Sex	
Women	12 (55)
Men	10 (45)
Domicile	
Inside Surabaya	6 (27)
Outside Surabaya	16 (73)

The most common clinical symptom was sudden cough (67%), followed by asymptomatic (23%) patients, cough with rhonchi and wheezing (5%), and cough with wheezing (5%). The distribution of clinical symptoms is shown in **Table 2.**

The type of foreign bodies found were mostly non-organic (91%), including pins (67%), clipboard nails (14%), plastic whistles (5%), and magnets (5%). There were also organic foreign bodies (nuts) for 9% of the

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sampled patients. The types of foreign bodies found are shown in **Table 3.**

Table 2. Clinical Symptoms of Patients

Symptoms	N (%)
Sudden Cough	15 (67)
No Symptoms	5 (23)
Cough and Wheezing	1 (5)
Cough, Ronchi, and Wheezing	1 (5)

*Each patient could experience more than one clinical symptom

Table 3. Type of Foreign Bodies

Type		N (%)
Organic	Peanut	2 (9)
Non-Organic	Straight Pins	15 (67)
	Clipboard nails	3 (14)
	Plastic Whistle	1 (5)
	Magnet	1 (5)

The foreign bodies were found in the left main bronchus (45%), trachea (32%), right main bronchus (18%), and some AFBs were not found (5%). The foreign bodies' locations are shown in **Table 4.**

Table 4. Foreign Bodies Location

Location	N (%)
Trachea	7 (32)
Main Bronchus Sinistra	10 (45)
Main Bronchus Dextra	4 (18)
Not Found	1 (5)

For the sampled cases, the duration between the incident to the bronchoscopy was less than one day (54%), two days (32%), and three days (14%). The duration up to Bronchoscopy is shown in **Table 5.**

Table 5. Duration up to Bronchoscopy

Duration (days)	N (%)
<1	12 (54)
2	7 (32)
3	3 (14)

Most patients did not experience AFB complications (90%), but 5% had an obstruction, and 5% had hemoptysis. A majority of the patients also did not experience bronchoscopy complications (81%), but 14% had a lesion, and bleeding (5%). The complications are shown in **Table 6**.

Table 6. Complication

Complication	N (%)
AFBs Complication	
No Complication	20 (90)
Obstruction	1 (5)
Hemoptysis	1 (5)
Bronchoscopy Complication	
No Complication	18 (81)
Lesion	3 (14)
Bleeding	1 (5)

In this study, the highest physical status in patients was ASA I (68%), then ASA II (18%), and ASA III (14%). Most patients also did not have any comorbidities (85%), but 15% had the following comorbidities: anemia (5%), obstruction (5%), and a patient (5%) with obesity, sputum retention, and hypernatremia. The patients' ASA physical status and comorbid factors are shown in **Table 7**.

Table 7. ASA Physical Status and Comorbidities

ASA and Comorbidities		N (%)
ASA		
ASA I		15 (68)
ASA II		4 (18)
ASA III		3 (14)
Comorbid		
No Comorbid Factor		19 (90)
With Comorbid Factor	Anemia	1 (5)
	Obstruction	1 (5)
	Overweight+ Retention Sputum + Hypernatremia	1 (5)

The premedication drugs administered were mostly fentanyl or the combination of fentanyl and midazolam (41%), followed by the combination of midazolam, atropine sulfate, and fentanyl (9%), and the combination of midazolam and atropine sulfate (9%). The most frequently used drugs for anesthesia maintenance were the combination of isoflurane and O_2 (27%), the combination of isoflurane, propofol, and O_2 (23%), the combination of sevoflurane and O_2 (23%), the combination of propofol and O_2 (18%), and the

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combination of propofol, fentanyl, and O_2 (9%). The anesthetic drugs used are shown in **Table 8**.

Table 8. Anesthetic Drug

Drug	N (%)
Premedication	
Fentanyl	9 (41)
Midazolam + Fentanyl	9 (41)
Midazolam + Sulfas Atropine + Fentanyl	2 (9)
Midazolam + Sulfas Atropine	2 (9)
Maintenance	
Isoflurane + O_2	6 (27)
Isoflurane + Propofol + O_2	5 (23)
Sevoflurane + O_2	5 (23)
Propofol + O_2	4 (18)
Propofol + Fentanyl + O_2	2 (9)

In this study, we found that most AFB patients who underwent bronchoscopies under GA were in the 11 to 20 years age group (73%) and most of these patients were female (55%). These results are similar to the research done by Rizk (7) who found that most AFBs occur in patients in the 10 to 20-year-old age group (81%) who were also mostly females (122 patients).

This study also found that most of the patients were from outside the city (73%) (8). A study conducted at the Dr. Mohammad Hosein Hospital Palembang in 2013-2015 also found similar results, where most AFB patients were from outside the city (55.81%) (5).

The type of foreign body found is mostly non-organic in the form of pins in 15 (67%) patients, and the most common location was found in the left main bronchus (45%). This result is also in line with a study conducted by Rizk (7) which showed that most patients with AFB were in the form of pins and the location of these foreign bodies was most often in the left main bronchus.

Moreover, the location of the AFBs found in this study are similar to the research conducted by Bin (9), who determined that most AFBs are located in the left main bronchus (32.3%). Additionally, a study conducted by Rizk (7) linked the findings of non-organic foreign bodies in the form of pins or hairpins being found more often in the left bronchus with the Bernoulli phenomenon.

Next, age is one of the factors that play a role in the entry of foreign bodies into the respiratory tract (10). Rizk (7) found that the subjects included in their study were female and wore the hijab. For women who wear hijabs and use pins, AFBs often occur. This is due to the lack of vigilance when securing the pins to be used, as subjects would hold the pins between their lips or teeth while fixing the hijab so that they could have their hands free to adjust the hijab.

The duration between foreign body aspiration and the bronchoscopy procedure is important because the patient needs to be immediately examined, diagnosed, and treated. The duration between events until bronchoscopy in this study had similar results to the study conducted by Puspa (11) where most patients would have their bronchoscopy done within less than 1 day (55%). Immediacy is very important because delays in foreign body action can cause a fairly large incidence of complications.

Most of our patients did not have any AFB complications. Complications of AFBs are different for each patient because there are predisposing factors for the occurrence of complications, namely the type, depth, and duration of foreign bodies in the body (12).

In our study, most patients did not experience bronchoscopy complications either. This is similar to the study conducted by Grosu (13). Bronchoscopy can cause minor and major complications. The predisposing factors for the occurrence of complications are the type, shape, and duration of foreign bodies in the body (12). Coughing is one of the complications in

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bronchoscopy procedures, which is unpleasant both for the patient and the anesthesiologist. Lidocaine nebulization 2% or lidocaine spray 10% is generally used to help prevent coughs during bronchoscopy procedures (14).

In this research, most patients were in the ASA physical status I (68%). This is similar to the research conducted by Yanmei, which found that most patients with AFB were categorized as ASA I and II (40 patients). ASA physical status classification can be used as a risk consideration for patients related to anesthesia and bronchoscopy procedures (15). Pre-anesthesia evaluation is the first step in a series of anesthetic actions performed on a patient. This evaluation aims to determine the physical status of preoperative patients, analyze the type of surgery, choose the type and technique of anesthesia, predict complications that may occur, and prepare the drugs and anesthesia tools (16). The premedication drugs that are often used in this study are fentanyl and a combination of midazolam and fentanyl (9%). Fentanyl is the most widely used opioid in anesthesia. It has a predictable time-to-peak effect of 3-5 minutes (17). Midazolam is a sedative commonly used before surgery. This drug can reduce anxiety, make the patient feel relaxed, and even give a drowsy effect. Midazolam works by slowing down the work of the brain and nervous system (18).

In this study, the most common drug used to maintain anesthesia is the combination of Isoflurane and O_2 (27%). Isoflurane is a halogenated ether in the form of a colorless, non-explosive liquid, does not contain preservatives, and is insoluble in blood but quite irritating to the respiratory tract. The recovery process is relatively faster than the currently available inhalation anesthetics, but it is still slower than sevoflurane (19).

Most of the patients (85%) had no comorbid factors that could complicate anesthesia procedures. But anemia (5%), obstruction (5%), and obesity followed by sputum retention and hypernatremia (5%) were found in one patient. Preoperative anemia is associated with increased postoperative morbidity and an increased risk of perioperative transfusion. We found 1 (5%) patient with anemia before bronchoscopy under GA. Lin Yulia (20) stated that preoperative anemia occurs 25% to 40% of the time in large observational studies. Airway obstruction is always a concern for the anesthesiologist. Inhalation induction is an option that is often used in patients with respiratory obstruction. Halothane in 100% oxygen is a suitable agent. However, sevoflurane is increasingly being used as an alternative to halothane in these situations. Sevoflurane is moderately effective but achieving a more rapid onset of action is difficult as sufficient depth of anesthesia is needed without an intravenous adjunct. With any form of airway obstruction, absorption of volatile substances is reduced, and it may take up to 15 minutes to achieve sufficient depth of anesthesia (21). In this study, patients with airway obstruction underwent intravenous induction and continued maintenance with sevoflurane.

Obese patients are more difficult to inject anesthetics because they require higher doses of drugs than people with normal weight (22). Approximately 1 in 50 patients develop preoperative hypernatremia which is directly associated with a 40% increased risk of perioperative 30-day mortality. Hypernatremia should not be ignored if a mild increase is associated with a significant increase in perioperative morbidity and mortality regardless of the underlying cause and other comorbidities (23). Patients who experience anesthetic complicating factors in the form of sputum retention would experience clinical symptoms of cough and shortness of breath.

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Cough and shortness of breath can cause sputum retention and lead to bronchospasm. The incidence of bronchospasm can have a fatal impact (24). However, none of the patients in this study experienced bronchospasm.

CONCLUSION

Most AFB patients who underwent bronchoscopies under GA were in the 11 to 20-years age group, female, came from outside Surabaya, had clinical symptoms of sudden cough, and had non-organic AFBs type in the form of a pin that was mostly located in the main left bronchus. The duration of the event until bronchoscopy was <1 day. Our patients did not experience complications for both AFBs and bronchoscopies. ASA I physical status was the most common in our patients. The premedication drugs administered were mostly only fentanyl or the combination of fentanyl and midazolam. The most commonly used maintenance drug for anesthesia is the combination of isoflurane and O_2. Most patients also did not have any comorbidities for GA.

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Conflict of Interest

The authors declared there is no conflict of interest in this study.

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Authors' Contributors

All authors have contributed to all process in this research.

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