Utilization of oxygen therapy in Mosul

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ABSTRACT

Objectives:. To document the appropriate way of oxygen utilization therapy for patients admitted in the medical and pediatric wards and to determine whether oxygen therapy as a medicine or not.

Patients and methods: The study involved ١٠٠ patients, ١١ children and ٨٩ adults, who were receiving oxygen therapy, in different medical and pediatric wards , in Ibn-Sina Teaching Hospital. The youngest patient was ٢ months and the oldest was ٨٥ years. Mean of adult patients ٥٦.٧ ± ١٦.١ years while mean of infant ٣.٥ ±١.٥٩ months . All patients who screened had oxygen apparatus at the bedside, physician orders for oxygen therapy, order of other medical treatment, diagnosis and clinical indication for oxygen therapy and pulse oximetry.

Results: Oxygen therapy was not indicated in ٧٥% of the cases, and oxygen was given without supervision during administration, while most other orders of medical therapeutic drugs were written properly and given by pharmacists. Most of the adult patients suffered from respiratory (٤٠%) or cardiac (٣١%) problems; the remainder (٢٩%) have other illnesses, ٨ of the children suffered from chest infection.

Conclusion: Oxygen therapy was poorly prescribed and poorly understood and paid less attention compared with other drug therapy.

الخلاصة

هد ف الدراسة: تهدف الدراسة الى توثيق الطريقة المناسبة لاستخدام الاوكسجين للمرضى الراقدين في ردهات الباطنية والاطفال وكيفية التعامل مع الاوكسجين كدواء.

المرضى وطرائق العمل: شملت الدراسة مائة مريض (١١ طفلا و ٨٩ من الكبار) راقد في ردهات الباطنية والاطفال في مستشفى بن سينا التعليمي . تتراوح اعمارهم من شهرين الى 85 سنة وكان معدل اعمار الكبار ٥٦.٧± ١٦.١ سنة وكان معدل اعمار الاطفار ٣.٥ ± ١.٥٩ شهر. وكان عند كل مريض جهاز اوكسيجين ،وصفة طبية من قبل الطبيب، وصفة ببقية الأدوية، مبررات استعمال الأوكسجين والتشخيص ومقياس كمية الاوكسجين بالدم.

النتائج: تبين أن 75% من الحالات لا تحتاج الى الأوكسجين وقد أعطي الأوكسجين بدون إشراف الطبيب خلال الاعطاء. بينما اعطيت بقية الأدوية بوصفة مكتوبة وصرفت من قبل الصيدلي المسؤول. وكان معظم المرضى الكبار يعانون من مشاكل في الجهاز التنفسي (٤٩%) او الجهاز الوعائي. وكان الباقي (٢٩%) يعانون من أمراض أخرى. وكان هناك 8 أطفال يعانون من التهاب في الجهاز التنفسي.

الاستنتاج: لا يعطى علاج الاوكسجين الاهتمام عند وصفه للمريض ولا يكون هناك معرفة بالطريقة الصحيحة لاعطاءه أسوة ببقية الأدوية.

Although supplemental oxygen therapy is valuable in many clinical situations, excessive or inappropriate supplemental oxygen can be deleterious[١]. According to human and animal studies, high concentration

of inspired oxygen can cause a spectrum of lung injury, ranging from mild tracheobronchitis to diffuse alveolar damage (DAD)[٢,٣]. The latter is histological indistinguishable from that observed in the acute respiratory distress syndrome (ARDS)[٢,٣], as well as extra pulmonary toxicity, the retinopathy of prematurity (previously called retrolental fibroplasia) has been attributed to the toxic effects of oxygen. A cohort study of ١٠١ infants demonstrated a significant association between the duration of transcutaneously measured PaO٢>٨٠ mm Hg and the incidence and severity of retinopathy[٤]. Central nervous system symptoms, including generalized tonic-clonic seizures, have been reported secondary to hyperoxia but are unusual in the absence of hyperbaric therapy[٤].

Oxygen is prescribed for hypoxemic patients to increase alveolar oxygen tension and decrease the work of breathing; the concentration depends on the condition being treated. Hyperoxia is poorly defined, but probably exists whenever oxygen tension exceeds ٢١% of atmospheric pressure. It appears to produce cellular injury through increased production of reactive oxygen species, such as the superoxide anion, the hydroxyl radical, and hydrogen peroxide[٥]. If the oxygen saturation is >٩٢%, oxygen therapy need not be routinely administered. If the oxygen saturation is ٨٥–٩٢%, oxygen therapy could be initially instituted at ٢–٣ liters/min via nasal cannula which would be expected to increase the saturation above ٩٢%. An oxygen saturation of <٨٥% is likely to require higher flows through a simple mask, titrated to achieve a saturation above ٩٢%. Hypoxia and acidosis are poorly tolerated by the fetus and should be aggressively avoided. From a fetal prospective, it is widely accepted that in non anemic women, maternal PO٢ should be kept at ≥٧٠ mmHg (or at an oxygen saturation of at least ٩٥%) to maintain adequate fetal oxygenation[٦].

The oxygen delivery system used in Ibn-Sina Teaching Hospital is compressed gas cylinder which has advantages such as providing highest flow, moderate cost, wide availability and low maintenance. While its disadvantages are heavy weight, and frequent refilling, it must be secured to prevent injury.

Oxygen should be regarded as a drug and should be prescribed by the physician who is responsible for all forms and documentation of oxygen therapy[٧]. This should include qualifying the arterial blood gas, the type of delivery system to be used (stationary system portable or ambulatory equipment oxygen-conserving device and so forth), the delivery device (nasal cannula , transtracheal catheter, mask), the liter flow under specific conditions (sleep, rest, exercise), the patients diagnosis and oxygen saturation ($SpO_٢$) [٨].

The aim of this study is to assess utilization of oxygen therapy in Ibn-Sina teaching hospital .

Patients and methods

This study was carried out on ١٠٠ patients (٥٠ males and ٥٠ females) during the period from May to July

٢٠٠٨, admitted to Ibn-Sina Teaching Hospital in Mosul, ranging in age between ٢ months and ٨٥ years. History was taken from the included patients regarding presenting complaint, systematic enquiry, medical history, allergy, drug history, alcohol, smoking, family history and social history. Complete physical examination with special attention to clinical manifestations of hypoxemia and hypercapnia **(**Features of hypoxemia are:-tachycardia, tachypnea, anxiety, diaphoresis, altered mental status, confusion, cyanosis, hypertension, hypotension, bradycardia, seizures, coma. Features of hypercapnia are somnolence, lethargy, restlessness, tremor, slurred speech, headache, asterixis, papilledema, coma, diaphoresis)[٩].

Investigations, diagnosis, and management were received of each patient and the oxygen saturation was measured by pulse-oximetry, during oxygen supplement and ٢٠-٣٠ minutes after cessation of oxygen therapy . Pulse-oximetry is one way to measure the oxygen saturation in blood. Small clip was placed on the finger, toe, earlobe or an infant's foot. This is a simple, convenient, painless way to determine the need for oxygen therapy. In this study, pulse-oximeter ٧٨٤٠ Kontron was used. The oxygen delivery device, oxygen concentration, and flow rate for each patient were recorded. Consideration whether an oxygen prescription was present regarding the device, concentration, and flow rate and whether the prescription was accurate. The patient was matched need in relation to the delivery device. and whether the flow rate and concentration were appropriate to that device. The following clinical conditions were considered appropriate indications for oxygen therapy such as (cardiac and respiratory arrest, hypoxemia SAO٢<٩٠%), systolic hypotension (BP<١٠٠ mm Hg systolic), low cardiac output which evaluated by echocardiography and clinical feature of metabolic acidosis and respiratory distress(RR>٢٤/minute in the adult) [١٠,١١].Assessment also included the dose and method of oxygen administration.

ANOVA test was used to compare measurement between different tested groups. $P < ٠.٠٥$ were regarded as being statistically significant[١٢].

Results

One hundred patients were included in this study. They were ٥٠ male and ٥٠ female. The youngest patient was ٢ months and the oldest was ٨٥ years. Mean of adult patients ٥٦.٧$\pm$١٦.١ years while mean of infants ٣.٥$\pm$١.٥٩ months There were ١١ children and ٨٩ adults. In ٧٥% of cases, there were no real indication for oxygen therapy P$\leq$.٠٠١. The order for giving oxygen was present in ٧٨ patients (٧٨%) out of the ٧٨ with written prescription, the order and dose was correct in ٦ patients (٦%) of case only. The dose of oxygen was written in ٥٠ patients (٥٠%) of cases while in ٢٢% of cases no dose was determined to oxygen. Observations of ٧٢ patients (from indicated or not indicated for oxygen therapy) with incorrectly written order for oxygen revealed the following errors. Firstly, wrong fractional inspired oxygen

concentration (٣٣%), secondly, flow meter off (١٩%).The order for giving oxygen and dose of oxygen are shown in Table ١.

			No. of patients	Written order (%) ٧٨	Incorrectly written order from (%) ٧٢
no order			٢٢	———	———
written order		correct	٦	٨%	———
		Incorrect	٧٢	٩٢%	———
	incorrectly written order	oxygen dose determined	٥٠	٦٤%	٧٠%
		oxygen dose not determined	٢٢	٢٨%	٣٠%

Table ١: Order for giving oxygen and dose of oxygen

Table ٢: Oxygen delivery devices

Equipments	No. of patients	%
Venti- mask	٨٣	٨٣
Nasal canula	١٥	١٥
Endotracheal tube	١	١
Tracheostomy	١	١
Total	١٠٠	١٠٠

A variety of delivery devices were used for the delivery of oxygen during this study, most patients incorrectly applied delivery devices (٧٧%). The delivery devices used are shown in Table ٢.

Most of the patients suffered from respiratory(٤٠%) or cardiac (٣١%) causes the remainder (٢٩%) from other causes such as leukemia, flaccid paralysis, chronic renal failure, diabetic keto acidosis, status epileptics, stroke, chronic hepatitis.

Discussion

Although oxygen is beneficial if indicated, it is toxic if used without the presence of hypoxemia[١٣]. Inhalation of gas mixture with an oxygen flow above (٦٠%) for longer than ٤٨ hours is toxic[١٣]. While in the presence of cellular hypoxia sometimes

oxygen therapy is of great value; however, it is of moderate value, and at still other times, it is of almost no value[١١]. Therefore, it is important to understand the different types of hypoxia, its causes including decrease cardiac output, hypoxemia, anemia, carbon monoxide poisoning and cyanide poisoning[١٠,١١]. As Blood gas analysis and lactic acid measurement were not available during the study, therefore clinical features of hypoxia, hypercapnia and pulse oximetry were depended.

Most clinical parameters used for indication of oxygen therapy are nonspecific and in the absence of blood gas analysis there will be misuse of oxygen therapy. The order of this study was correct in only ٦% of cases as most of the orders did not mention the duration of oxygen therapy and whether administered continuously or not and errors in fractional inspired oxygen concentration and in flow meter. The dose was correct in ٦% of cases only as most of the order did not contain the flow meter of oxygen and the delivery device, so the dose of oxygen cannot be determined. In other study over ٥٠% of hospitalized patients were receiving supplemental oxygen without a written order[١٣]. Most patients incorrectly applied delivery device such as a mask is loosely fitting over the patient's nose and mouth or obstruction of the air entrapment vents has two consequences, firstly, the oxygen delivered to the mask is not diluted, which leads to a higher than anticipated oxygen flow. Secondly, the total flow of gas to the patient is reduced, which may lead to the re breathing of carbon dioxide. Venturi face masks were used in ٨٣% of patients in this study, like other study. Of the commonly used masks, the venturi mask is that most frequently utilized in the general wards of Baragwaneth Hospital, Johannes burg[١٤]. High flow Venturi oxygen masks yield a precise fraction of inspired oxygen by using of specific valve. The size of the valve aperture ensures that specific proportions of oxygen and entrained air are mixed to obtain a fixed oxygen concentration in quantities that exceed the full ventilator requirement, the correct use of these devices is essential for the avoidance of side effects from this drug[١٥].

This study draws the attention to the following points:

oxygen is a drug, like other drugs is always used in optimum dose to obtain the desired effects and avoid unnecessary usage. The aim of therapy is to avoid hypoxia and hyperoxia. Oxygen is given to treat hypoxaemia and ensure adequate arterial oxygenation (SpO_2 > ٩٠%)[١٦]. The therapeutic goal is to ensure adequate oxygenation of vital organs, the inspired oxygen concentration should be the lowest value that results in adequate arterial saturation (SaO_2 >٩٠%)[١٧].

In conclusion that oxygen is provided in medical wards liberally and most oxygen prescriptions are inappropriate, in unregulated fashion and not adequately supervised. Education of medical personnel should stress more prudent prescription and introduction of a prescription chart for

oxygen therapy with education of patient who need oxygen therapy to deal with oxygen as a medication.

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