TITLE:

Intensive Care Management of Acute luryngotracheobronchitis (LTB) patients admitted to Kenyatta National Hospital Intensive Care Unit- 1972 August to December 1984.

by

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A dissertation submitted in part fulfilment for the Degree of Master of Medicine (Anaesthesia} bf the University of Nairobi.

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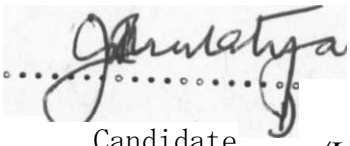
DECLARATION;

This dissertation is *y origin work and has not been presented for any degree in any other University.

Signed; 

Candidate /U C4 6

This dissertation has been submitted for examination with my approval

Signed: 

· Supervisor ^ V^WtthhJ)

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A C K N O W L E D G E M E N T S

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My wife Lucy for her cooperation during the period of study.

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SUMMARY

A retrospective studv was carried out on 209 cases of laryngotracheal)ronchitis (LTB) treated in the Intensive Care Unit (I.C.UO at the Kenyatta National Hospital (KNH) from Aufrust 1972 to December 1984. There were 134 males (64.1ˆc) and 75 females (35.9?o), and therefore, a Male:Female ratio of 1.8-1.

The average age of these patients was 3ˆ*9 months, and the the range vas from 2 months to 13 years; about 80-,c of these patients were 2 years or less. About 65.6% of the patients vere admitted to I.C.U.from the Paediatric Admission ward (P.O.Iv). Late admissioh of LTB patients to I.C.Uo was noted on about 13·8?o of the patients who were admitted in LTB Grade XV.

About 66°/o of the patients had post-measles LT3. Bronchopneumonia and congestive cardiac failure (CCF) were the main complications before and after admission on most of these patients. Clinical impression was the main criteria for the I.C.U. admission. Blood-gas analysis (BGA) on admission were done in only 24.4% of the patients. About 42.9%o of these BGAs showed respiratory alkalosis. About 44% of these patients had 110 serial BGAs done.

The duration of stay in the I.C.I. ranged from

one day to 183 days vith an average of 11.2 days. Organisms commonly grown from tracheal aspirate cultures were Klebsiella, Pseudomonas and Staphylococus aureus, These Organisms were resistant to commonly used antibiotics. Although most of the patients had lav packed cell volume (PCV) only 16 patients had blood transfusions done.

A. mortality rate of k5% vas noted and this vas high as compared to that found in other centres. Bronchopneumonia and CCF vere the main causes of death. The high mortality rate appeared to correlate closely vrith late admission to I.C.U, complications on admission and other complications arising in I.C.U.

Active imnunization against measles has reduced the number of LTB patients admitted to I.C.U. progressive! over the last few years.

INTRODUCTION AND REVIEW OF LITERATURE

Acute laryngotracheobronchitis (LTB), commonly known as croup, is an inflammatory disease of the upper respiratory tract, consisting mainly of subglottic oedema. It is a subacute viral illness (1-3) characterised by fever, barking cough and stridor. Etiologic agents in developed countries are mainly parainfluenza viruses 1 and 2 and adenoviruses (1,31, 34, 39, 40, 51, 60, 62). In developing countries, measles is the commonest cause of LTB (50, 67).

The illness occurs mainly in cold months and usually lasts for 3-7 days. Males affected by the disease outnumber the females (5-8, 13, *25-26)*. Acute LTB affects children aged from 6 months to 14 years (15,53). Its treatment has changed alot in the last fifty years (15,21,32). Very mild cases are adequately treated as out-patientrs: moderate to severe cases are treated in General Paediatric wards, while very severe cases require Intensive Care Therapy (21,30,67). In the treatment of LTB oxygen is indicated because hypoxaemia can occur in patients with mild airway obstruction (37), and since the hypoxaemia associated with LTB corresponds with a raised respiratory rate (25,27, 50). Humidification of inspired gases used in the treatment of LTB helps to prevent drying up of secretions (33). Moist air,

though commonly used, can cause water intoxication (41) and hyponatraemia and has not been shown to relieve symptoms, reduce obstruction or alter the clinical pattern of the illness (66). The use of saline and intermittent positive pressure breathing (IPPB) has also been shown to lead to clinical improvement in mild LTB patients (38, 65).

Racemic adrenaline has been used in the management of acute LTB. It has vasoactive action of adrenaline without rebound vasodilatation and cardiovascular side-effects of tachycardia and hj'pertensicn. (15)* The use of racemic adrenaline in treatment of acute LTB has been controversial over the past few decades and results on its use have led to varying conclusions: it can lead to avoided endotracheal intubation in only few patients (13》50); IPPB and racemic adrenaline decreasesthe incidence of tracheostomies (″10,11,15,32);ˆ IPPB and nebulized racemic adrenaline is more effective than mist therapy alone (11); the use of racemic adrenaline gives short-lived beneficial effects (7,11,ˆ5), or it has no effect at all (38). Racemic adrenaline, however, has been shown to reduce airway oedema and obstruction in acute LTB as well as post-intubation croup (1,4, 11, 15, 26, 32, 38, 42-43, 45, 61). The side-effects of racemic adrenaline are minimal, and it is useful in acute LTB since the disease usually-

runs its course before tolerance to its effects lias had time to develop. Initially treatments may be repeated at frequent intervals. Lessening the need for treatment with racemic adrenaline is a clinical indicator for improvement in a patient's condition (26).

An artificial airway is necessary in -some patients vith severe LTB. Several factors point to the need for airway support: patient fatigue, decreasing response to racemic adrenaline, and toxicity with evidence of bacterial superinfection. Tracheostomy vas for many years the procedure of choice as initial studies suggested that nasotracheal intubation might have serious airway injury(12,36,55). However, recent studies show that carefully done nasotracheal intubation provides effective treatment for LTB and reduces morbidity when compared to tracheostomy (12, 28, 35, UU, 50, 67, 71, 72, 83-84).

Endotracheal intubation has been used for a long time and most of the problems associated with it can be detected, and serious complications avoided. The use of non-irritaht materials and methods of ensuring leak around the tubes have reduced the incidence of subglottic stenosis (71,72).

Nasotracheal intubation is now prefered to tracheostomy in many units but in units vhere personnel are unfamiliar with nasotracheal intubation, tracheostomy is still a satisfactory alternative. However, where severe laryngeal obstruction is present and in older children likely to require artificial airway for a long period tracheostomy is the method of choice (67,72). The complications of intubation include pneumonia,atelectasis and subglottic stenosis (26,50). These complications are related to the duration of intubation (71), and any factor which increases tissue trauma and reduces tissue resistance to injury and infection following removal of the tube (71)* The incidence of intubation sequelae has not been consistently or clearly defined in terms of length of continuous intubation (58,71)* Longer periods of intubation may have very low rate of serious complications, associated with it (71). The complications arising from the conversion of nasotracheal intubation to a tracheostomy may be greater than those expected from increasing the length of endotracheal intubation (71). In developing countries, the duration of endotracheal intubation is longer and percentage of severe LTB patients is higher than in devsloped countries (13,50, 67).

The greatest controversy in the treatment of acute LTB revolves around the use of Steroids (8, 16,

18,-21, 29, 50, 57-59, 65)· Their known anti-inflammato effects, particularly their actions on stabiling lvzozvmal membranes and ro diminish capillary dilatation and permeability (33) have lead to vide applications and research, although methodologic problems have raised questions about validity of the results (1,6, 16).Many authors feel that steroids do not alter the clinical course of acute LTB. (1,7,8,58-59, 63); others maintain that steroids given in adequate doses provide an effective treatment (6, 19-21, 57, 64), while others feel that steroids may have beneficial effects in certain types of LTB (1,19). Random studies using low dose steroids have shown that steroids have tracheostomy-sparing effects (6,20-21).

The use of steroids has also been shown to lessen the number of treatments with racemic adrenaline (9). It is now widely accepted that a single dose of steroids given early in the course of acute LTB provides most beneficial effects, and it is safe e.g. 1.0-1.5mg/kg of dexamethasone(9). Less than 0.3mg/kg of dexamethase can be considered an inadequate dose with which to treat acute LTB (16,17) while a dose of 0.3mg/kg, or greater, can be considered adequate (26).

The use of hydrocortisone 100mg intrainuscularly initially suggested by Davison (21) or its equivalent of dexamethasone or prednisone (21) is adequate in moderately severe LTB. The use of steroids appears contraindicated in immunologically depressed malnourished LTB patients (5*67). Although LTB is a viral infection, superinfection with streptococcus pyogenes, staphylococcus aureus, streptococcus pneumonia, Haemophilus influenza etc., does occur (1, 21). It has also been noted that LTB in under-priviledged children rarely occurs alone. It is usually associated with lover respiratory tract (LRT) infection, pneumonia, anaemia, malnutrition and other complications of measles e.g. gastroenteritis and herpes stomatitis and cardiac failure (8,21,37, 46-47, 50, 67, 73, 75-76, 78-81). Therefore, the routine use of antibiotics is widely accepted (1,10, 13,21, 30, 48, 50, 67) although some authors feel that antibiotics, though commonly used, are of doubtful value in uncomplicated LTB (52,54).

Acute LTB can progress rapidly to respiratory failure, and detection of the onset of respiratory-failure clinically is very subjective. Repeated blood gas analysis is therefore very important.

BGA of these patients has shown tliar their arterial blood partial pressure of oxygen ($Pa0_o$) is lower than the normal for the age gr;oup and that most of the patients have ˆterial blood partial pressure of carbon dioxide ($PaC0_2$) greater than nrrmal values (25)· There is relationship between PaC0ˆ and severity of airway obstruction (68) and inverse relationship between $PaC0_o$ and respiratory rate (25).

LTB patients also frequently have gas exchange failure which does not correspond with the clinical picture. The presence of cyanosis in these patients indicates hypoxaemia, but the absence of cyanosis does not exclude moderate hypoxaemia (27). BGA in LTB patients has also shown that most mild to moderately obstructed patients tend to hyperventilate and therefore the PaC0ˆ rise which accompanies decompensation may not be 9/bove the normal by the time intubation is needed.(82). There is no relationship between arterial BGA results and the clinical picture and therefore BGA, cannot alone be used to assess severity of LTB. Furthermore, bas no value in assessing the need for intubation(ˆ

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Therefore, the decision on when to intubate a LTB patient depends upon many factors; clinical grounds e.**g.** extreme respirator)- distress, pneumonia

cardiac failure; significant arterial hypoxaemia and hvpercarbia (50) and scoring system (4ˆ).

However, no absolute indications to intubation or extubation exist (67,50).

Mortality rate of severe LTB is higher in dev-loping countries (7,39,50,67,7?) than in developed countries (10,13, 2o, 53, 7ˆ-75) where the duration of I.C„U. stay of severe LTB patients is even shorter (10,13) than in developing countries (50). Long-term follow-up of LTB patients show that they have further airway involvement manifesting as recurrent LTB (?4) and clinical bronchial asthma (5,19,20, 25-26).

MMS AND OBJECTIVES

This study was undertaken to:

Evaluate the management of severe LTB patients admitted to Kenvatta National Hospital IoColJ. between August 1972'and December 1984

To determine the complications of severe LTB and their management.

Make suggestions on how to improve the management of the patients.

MATERIAL? AND METHODS

4. retrospective study of 209 acute LTB patients admitted to the I.C.U. (KNH) between August 1972 and December 1984 was done. From the I.C.U. admission registers, the names and other particulars were obtained and their case notes studied closely. Information relating- to I.C.U. management, complications^ mortality etc was carefully studied and analysed. A data collection form was completed for each patient.

Most of the I.C.U. management of these patients is outlined in this study.- The management also included the following:

1). Vital signs monitoring: Pulse-rate by palpat^ of peripheral arterial pulses, one hourly; respiration rate by observing and counting of chest movements. One hourly; 4 hourly Temperature charting using mercury Thermor^et¥ 4 hourly blood pressure charting' using sphygmomanometer and arm cuff method.

(2) Nursing Care: Bathing, Turning 4 hourly, suction (at least 4 hourly) Nasogastric feeding 4 hourly, Care of pressure areas ^ weighing once daily.

Continuous Electrocardiography (ECG), central venous pressure (CVP) monitor!nf* input-output charting, physiotherapy attt', 4 hourly with endotracheal tube, tr《ch*f*

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(2) Nursing Care: Bathing, Turning 4 hourly, suction (at least 4 hourly) Nasogastric tube feeding 4 hourly, Care of pressure areas and weighing once daily.

(3) Continuous Electrocardiography (ECG), rarely central venous pressure (CVP) monitoring, input-output charting, physiotherapy at least 4 hourly with endotracheal tube, tracheobronchial

or/and oral suction.

laboratory investigations, including full hcamograins, culture and sensitivity of tracheal aspirates twice weekly.

Radiological investigations, mainly chest X-Ray films.

RESULTS :

The results of this study were as follows;

Out of the 209 patients studied T34 (64.TV) were miles and ″5 (35.M) wre females; giving a male: female ratio of T.8:T.0 (Table I).

The age of the patients ranped frcn 2 months to T56 months, and the mean was 30.9 + 4.9 rroths. 0 igure t and fable 21. About R0.01 of the patients were 24 months (2 years) or les£ .

About 65 0》 of tl>o p3tients had post-measles LTB. There were no viral studies done on the 209 patients studied. The aetioloric agents of the LTB uere therefore, based on the clinical manifestations of the disease . Diagnosis of viral LTB (ahait >1'-1¥os made when there was no clinical evidence of measles and it was therefore ass;zred that the LTB was caused by other viruses fother than measles virus″) ee respiratory syncitual virus, parainfluence etc.(Table 3) .

The grading of LTB m admission to ICII was done on the following clinical grounds:

Grado I: LTB with hoarseness of voice and mild respiratory distress.

Grade TI: LTB with moderate respiratory distress.

Grade III LTB with severe respiratory distress requiring endotracheal intubation.

Grade TV: LTBndth severe respiratory distress requiring endotracheal intubation and with associated congestive cardiac failure (CCF).

About 13.9* of the patients were admitted to TCU in LTB gTade TV (Table 4) .

Only 24.4* of the patients had blood eas analysis (BGA) done on admission to TCU and about 12.9% of these BG4s showed respiratory alkalosis (Table 51 .

About 4-i.Ot of the patients had no serial BGAs done in ICU A total of 589 blood samples were taken for BGA in about 66; of the patients admitted (Table 61 .

Most of the LTB patients studied had one or more factors complicating their disease . Bronchopneumonia and congestive cardiac failure (CCP were the main cccmlicatim: gactors occuring in 5T.6? and 13.9* of the patients respectively . vjost of these factors played an important role in the final prognosis of the I.TB patients while other;did not contribute to the ICU management and prognosis fTable 7).

Only about 12.0% of the patients needed no airway management in foim of endotracheal intubation tracheostomy or both. These patients were admitted in LTB Grade IT and did not progress to LTB Grade Til (Table 8). 86t of the patients had nasotracheal intubation done, ″fi-ie duration of intubation ranged from one day to 54 days, average 21.5 days (table 9 and Figure 2) .

Complications of nasotracheal intubation included laryngeal stenosis, Laryngeal, papilloma, blockage, removal or dislodging of the tube (Table 10). The duration of nasotracheal intubation in 6 patients ″ had laryngeal stenosis ranged from 7 to 3T days. No relationship WFS found endotracheal intubation and development of laryngea? stenosis.

Indications for tracheostomy were failed intubation, long duration of intubation, laryngeal stenosis and obstructed type of breathing even after endotracheal intubation. Only 16 patients (7.7t) had tracheostomy done (Table TT).

Tracheal stenosis, Laryngeal papilloma surgical emphysema, bleeding and pneunothorax were some of the complications of tracheostomy (Table 12). Although nasotracheal intubation was done in about 86.61 of the patients compared to about of the patients who had trncheostom- done, only about 3.3* of intubated patients developed laryngeal stenosis while *2S%* of tracheostomy patients developed tracheal stenosis. Most of the patients developed various complications which influenced the ICI' management and prognosis. Bronchopneumonia and were the main complications occuring in 2T.8* and 22.SI of the patients respectively (Table 13).

All patients admitted to TCU were put on at least one systemic antibiotics. The decision on which antibioatics to put a patient on depended on many factors: (i) which year the child was admitted to ICU: in early 1970s most of the children wore empirically started on Ampicillin and another broad-spectrum antibiotic. In 1980s the use of crystapen/ Gentanycin combination has nearly become routine treatment.

(ii) Clinical judgement: If a patient was not responding to the antibiotics already started on in the wards admitting LTB patient to ICU the antibiotics were stopped and 3 broader and clinically more specific antibiotic started.

(iii) Culture ans sensitivity tests of tracheal aspirate, blood samples etc.

(iv) Availability of the antibiotics eg. crystalline penicilline was used in 51.71. of the patients while a newly introduced antibiotic cefotaxime (Claforan) was used in It of the patients (Table 14).

Tetracycline eye ointment was the only onthalmic antiobioc used in 14.4! of the patients.

I6J out of 209 patients (about "R.Stl were put on steroids . About 61.6* of the patients treated with steroids were treated with hydrocortisone (Table T51 .

The use of r[accm] *[c] adrenaline for treatment of acute IT? patients in our TCIl has declined. In 1975 12 cut of 52 f2S*;1 patients admitted to Idtwith severe LTP were treated with racemic. adrenaline using a nebulizer and intermittent positive pressure breathing (IPPB") while in 1984 35 patients were admitted to Id' with severe LTB, of which only 2 f5.71) were treated with racemic adrenaline (Table 1b).

The range or other dnigs used is shown in table I?. The drues were used to (i) treat complications of LTP ctt admission and those arising, in ICU eg CO[7], convulsions, hyperpyrexia etc.

, Cii) To facilitate artificial ventilation eg Diazepam.

(iii) To facilitate removal of secretions eg Rromhexime - a mucolytic agent.

(iv) FOT nutritional support eg parenterovite I and II, Trynhosan' and sorbitol.

Only 4 out of 209 (1.91) patients had hypokalemia on admission which was treated with potassium chloride supplements. One patient had hyponatremia on admission which was corrected by half-strencth darrows drip. Few patients had abnormal serum electrolyte results while in ICU (Table 18) .

The incidence of anemia was low . A total of 74 hematocrits were analysed. The average packed cell volume (PCV) vaa 32.5*.

All blood transfusions were done in patients with PCV less than 301

9 patient? were discharged alive fro* TCI' after nasotracheal intubation and successful extubation. The decision cn when to extubate a patient was based nninly cn clinical croimds fee no sign of lower respirator*' tract infection acceptable PCV, good cough reflex) rarely supported by BGA results. Most of the patients had a successful first trial extuhaticn (Table TP) .

A total of 124 tracheal aspirate cultures were done. The ccnmonest organism cultured was Klebsiella fTable . The organisms cultured from tracheal asnirates were resistant to ccmncmly used antibiotic^ . Klebsiella was mainly sensitive to Gentamycin, Kanamycin and Polymyxin B; Psendcrronas mainly sensitive to pvcrcn, Gentamycin ;utd polymyxin B, staphylococcus mainly sensitive to reptrin, cloxacillin and erythromycin and nroteus mainly sensitive to Gentamycin . Most of these organisms were resistant to crystalline penicillin and Ampicillin .

The duration of TCU stay ranged fron T to.T83 days with a mean of II.2 · T.6 days. About TO. 51 of the patients studied had one day stay in TCTI .fTable 21 and Figure 3). 94 out of the 209 patients admitted to ICU died. This gives a mortality rate of 4St . Broncho-preunonia and CCF were the main causes of death fTable 22).. The differences in prognosis of the LTB patients corresponding with LTB grade on admission wore statistically significant. Late admission to ICU ie LTB. Grade IV was associated with poor prognosis fTable 23) .

DISCUSSION

Acute laryngotrachcobronchitis (LTB1, laryngotracheitis (LT) and croup arc sometinict. used to describe slightly different clinical conditions (2,16). In this study acute LTB, viral LT and croup were used synonymously.

¥arious male:female (M:F) ratios in acute LTB have been reported. Massicotte et al in 1973 gave M:F ratio of 2:1. The MsP ratio of 1.8:1 got in this study confirms the high occurrence of LTB in males. The widest age range given for LTR is 6 months to 14 years (13). The range in this study was 2 months to 156 months (13 years) which shows that LTB can occur at nn earlier age. About SO″》 of the patients were 2 years or less. Therefore, the age distribution is as expected of a disease of early childhood. However, the average age in this study of (30.9 months) is higher than Dan sky's figure of 17.7 months already thought to be high (50),

Mild to moderate LTB patients are treated in General paediatric wards. It is therefore, not surprising that most th《
of the patients in the study were fromTVaediatric Observation wˆvrd (P.O.W) although rarely LTB can present with acute onset of symptoms mimicking a foreign body in the respirator)' tract. Such patients are therefore, admitted to Ear,Nose and Throat CENT) wards and may even have direct laryngoscopy or bronchoscopy done before diagnosis of LIB is made as seen in this study.

The dociftion ar» to whon to transfer LTB patient£ to K.¥.H. I.C.V. depended mainly on clinical grounds backed rarely bv blood pas analysis (BGA) nfttltli About 73.7'> ol the patients were admitted in LTB Grade 111 and were intubated o$_{r}$ lmd tracheostomy done. About 12.and 13*9ˆ were adihittod in Grade II and IV respectively. Thin late admia$_{s}$ion to 1.C.1″, was perhaps a major contributing factor to poor prognosis.

The aetiology of LTB in developing countries is different from that in developed countries where parainfluenza viruses 1 and 2, Influonza A and ade-ovirusos are the main agents (1·31,39,ˆ0,51, 00, 59). Dansky (1978) in his South African study of I.C.U. - treatod LTB patients (.10) h《》d 135® postmeasles patients. Wesley (67) (South Africa) quotes 75f< postmea&los LTB. In this study about 66# of the patients hud pestmoasles I.Tb which further confirms that measles in still the commonest cause of LTB in developing societies. There $_{or}$„ many factors which adversely affect the couv$_{90\ 0}$f LTB In developing countries. Lower respiratory tract (LRT) involvement is common ('i7» 73. 7'») oven in up to of the patients (67). Congestive Cardiac

Failure (CCK) or symptomatic myocarditis, diarrhoea, malnutrition (50, 57《 7ˆ) and iron deficiency onuomi'u, (HO, 8 J J are some the common premorbid complications. Therefore, the occurronce of bronchopueumaniA in 31.65c of the patients and CCF (13.9fr) and other multiple complicating factors in tliis study roflect the typical picture of LTB expected in a developing countries.

Blood gas analysis (HC《A) done on admission showed that about 19/* of the patients had acceptable results, about ''<2.9$ had respiratory alkalosis and only 7. 9& showed respiratory acidosis. These findings throw some doubts on the usefulness of BGA in usaessinn severity of LTU or making A doolsion as to when to admit a patient to I.C.U. or intubute a severe LTB. patient: this point has beon strossed by various authors (>3, 25, 50, 67-68, 82).

Electrolyte imbalance in sovnro LTB pationts on admission lias not been documented, although it is know.1 that diarrhoea und dehydration are frequent complications. Our patients vnro routinoly put on half-strength Darrows drip in their admitting wards. Theso intravenous infusions v《ure continued in I.C.U. and nasogastric tube feeds wero xtartod when it was thought the chila could tolerate them. Therefore,

only 2.4; and 8.2!. of the patients had significant electolyte imbalances on admission to ICU and while in TCI? respectively. The ICU manaremcnt of severe LTP patients in KNH included respiratory support, Oxygen, steam, antibiotics, steroids, racemic adrenaline and management of complicating factor.* on admission and those arising in ICU.

All the patients in this study were given oxygen and about 22» required endotracheal intubation and T-piece oxygen. About 59.3ˆ had cndotcochcal intubation, steam and oxygen tent. The use of oxygen |$_{nourljn}$j$_{t}$ j$_{5\ v}$er>- much in keeping with the alreadv known advantages of oxygen therapy in LIB (25,37,50,57). The advantages of humidification of inspired gases in treatment of LTR feg hyponatraemi and water intoxication (41,54,66″) are known; however there was no association between hyponatremia and steam therapy in the 59.3* patient who were treated with stean. About 40.9″ of the patients could not be treated with stean, due to temporary unavailability of nebuli:ers, mechanical failure of nebulizers and or unavailability of steam tents.

Airway management: 12$ of the patients were admitted in LTR Grade II and needed no respirator)' support. About 86.61 had nasotracheal intubation done while only 11 had tracheostomy alone done. About 6.71 had tracheostomy and endotracheal intubation.
Wesley et al (67), IXincan ct al in T984 (26), Thomson et al, (13) and Danskv et al (50) report intubation of 67',, I21,I8t and 721 respectively.

Since the severity of upper airway obstruction in LTP can he estimated by the need for tracheostomy or intubation, the low intubation rate in developed countries (13,261 compared with the rates in developing countries *(67,* 50″), and the rates in this study (Table 8″) further confirm that LTB in a developing country represents a very different picture from than th3t seen in developed countries.

Endotracheal intubation does not relieve airway obstruction in LTB with associated LRT disease. Such patients require assisted ventilation or continous positive airway pressure(CPAP) for the management of their conconmitant bronchopneumonia (67). Dansfcy et al (50) report 24* full ventilation, 18* CPAP and 42* bronchopneumonia rates. About 29.2* of patients in this study had assisted ventilation (IPPV) and 5.3* intermittent positive pressure ventilation (TPFV) and positive end expiratory pressure (PEEP). These rates of assisted ventilation compare well with the high rate of bronchopneumonia on admission (31.6*) and during ICU stay (2″.8*).

The duration of endotracheal intubation depends on the severity of /LTF, complicating factors on admission and complications arising during the management in ICU. The high rates of bronchopneumonia, CCF, diarrhoea and other multiple complicating factors during admission and arising in ICU therefore prolonged the intubation period in this study to a mean of 21.5 days (and I to 54 days range) compared to Dansky's 5.5 · 6.5 days (50), Thompson's 40 hours (13), Shuller and Birck's 88 hours (28). However, the rates of bronchopneumonia, CCF and dia Thoea are similar to ones reported frcm the two south Africa

studies fS0,6~1 . Severe oral herpes reported by th two authors was not found in this stud)- . Tn KMI.TCU" nasotrachel intubation v,p? done unless tracheostomy vas indicated ee. after failure to intubate, lone duration of intubaticn, laryngeal stenosis an.* ol stmcted breathing even after intubation. In the early 1970s the duration of nasotracheal intubation vas considered lonr, in our ICU, after 2 weeks, but in the 1980s no specific period of contincus intubation was considered lone. The lumber of trnchonntcnics ir our unit had also declined with time from T97? to 1984'. Serious complications of nasotracheal intubation (laryngeal stenosis in and laryngeal r mllona in 7*1* of the patients intubated") were lower than the complies tiers of tracheostomy (in tracheal stenosis in 25*. and laryngeal papilloma in 6i3$ of the patier.tr vho had tracheost'-mies") These findings are sirilar to those pointed out on the advantages and disadvantages of tracheostomy and intubation outlined by Wesley ct al (67) and are a further Proof that endotracheal intubaticn is safer for relief of upper airway obstruction than tracheostomy as documented by many author* . (12,28,35,44,50,67,70-72, 83-84") .

Antibiotics were used in all patients in this study. Most of the patients had LRT disease, postmeasles immuno-spprcssion and malmitrition. The combination of crystapen (Crystalline penicillin in 51.91) and Gentamycin C35.0S of patients) started on admission to TCU her,efore appeared justified. The organisms grown from tracheal aspirate cultures were mainly Klebsiella and pseudemonas which are more virulent and resistant to antibiotics than organism isolated in other studies (I,2I"i. The resistance of these organisms to ccmonly used antibiotics called for the use of newer antibiotics eg claforan. Amoiciliin which is the popular antibiotic for complicated LTB (6") was used in only

31.61 of the patients.

The use of antibiotics is less frequent in the treatment of uncomplicated LTB seen in developed countries eg in 50* of the patients (261 while rate of use of antibiotics is high in LTP in developinq countries ctr TOO* in the F uth African study (501 .

The use of steroids in LTP is accepted by many authors (6,TP-T2,5~, 64″). In this study about 78.5*. of the patients were put on steroids. The doses of steroids used eg 50 mg hydrocortisone three tiroes daily or 10 mg twice daily prednisone, were above the effective dose' in LTB recotmended by Davison (2T). However the study showed that 66.01 of the patients had postmeasles LTP and T2 f5.″T) had Kwashiokor. The use of steroids in 78.51 of the patients with such a high incidence of irommosuppressing factors is questionable (5,67).

About 17.71 of the patients had racemic adrenaline and IPPB . The usefulness of racemic adrenaline in LTB is controversial (T,4,″,TO,IT, 13,15,26,38,45-,50, 42-43,61). Considereing that most of the patients had LRT disease and CCF with associated tachvc rdia, the use of racemic adrenaline in our unit may have had more disadvantages than' advantages (ICU consultants personal connunication) and hence the decline in its use in treatment of LTB in our unit.

Three patients were treated with subcutaneous adrenaline and two with nebulised isoprenalinc. The usefulness of these drugs in LTP, or its complications, has not been established. ″Sedation with a small dose of diazepam reduces unnecessary agitation and wasted energy and does not reduce respiratory effort or mark the physical signs monitored for the degree of obstruction (67)″·

This fact was reflected in this tudy where ahout 49.31 of the patients were given dia:er>am mainly to facilitate artificial ventilation. Chest physiotherapy with pharynegeal si»ction though reccnnended at least twice daily (6″) was done nore frequently, even sometimes half hourly, in our un::. Most of the other dra.es used in ICU uere Jised to treat specific ccrmlication but the use of a few drugs cannot pass without challenge: Hromhexine (Bisolvon), a mucolytic agent was used in about 2T.IS of the natients; terbut3line (Bricanvl) in about 13.9° , and salbutanol (ventolin″! in about 12.0'r of our patients. The advantages of using Bromhexine over the ensuring of adequate hydration of the patient and hinridi^ication of inspired eases have not been established (561. Salhutarool and Terbutaline are selective B-2 agonists with little action on BI receptors. Considering that Bronchopnetnonia and CCF with associated tachycardia were present in 59.4*. and 36.-U of thepatients in IGI respectively, the usefulness of these bronchodilators, which have not been shown to have any effect in L!″B and which may even worsen the tachycardia, is doubtful.

The use of propranolol to treat tachycardia caused by respiratorv failure as was the case in 7 of our patients, should be discouraged.

Lomotil and Kaolin sedative which were used alot in the I9?0s to treat diarrhoea have been banned due to their side-effects in children.

Newer drugs like (I modiura) Loperamide are now used to treat severe diarrhoc.i associated with postmeasles LTB, which is not adequately treated with intavenous infusions alone.

Pyrexia in LTP children is associated with increase in pulse and respiratory rate, cardiac output, gas exchange and oxygen consumption. Acetyl salicylic acid (Aspirin) was used alot in early 1970s in cm-unit to control pyrexia, but due to increase in incidence of asnirin poisoning, Tndomethacin findocid) suppositories, which arc more convenient to use in children and is relatively safe, was widely used (in 46. of patients).

The decision as to when to extubate the patient has no hard and fast rules (50,67) though various suggestions have been made, based on clinical grounds, satisfactoiy BGA results and scoring system. Most of the patients in this study had Bror.chopnein>onia, CCF and other complications and there-fore trial extubation 3fter 2-4 days of intubation suggested for uncomplicated LTB by Wesley et al (67) and Schuller and Birck (28) could not be tried. About 91.81 of the patients in this study who had beej. intubated and were finally discharged from ICU, had first successful trial extubation. This gives a lower first extubation failure rate of 8.21 compared to Shuller and Birck's reintubation rate of 171 (28).

Tho duration of ICU stay probably reflects the severity of LTB and its associated complications. The duration is also shorter with endotracheal intubation than with tracheostomy (28). The duration of ICU stay was 6.7 · 4.3 days in Dansky's South African study compared to 3.9 days in IXmcans USA study (28) and other studies 2.1 days (15) 34.4 · 17.7 hours (9) 3.45 days (10) therefrre the average duration of ICU stay of II.2 days got in this stud)' is, as expected, long for LTB ICU managed patients in a developing country.

The mortality rate of severe LTB is higher in developing countries 150,47,7?) than in developed societies whose mortality rate is less than 2 (12,25,26,4″,74). The highest mortality rate reported frcm a developing country is 161 (50). Therefore the mortality rate of 451 got in this study is extremely high. Bronchonneirnonia and CCF, which were the main conmlicating factors on admission and 3lso the main carpi icating ractors arising in ICU were also the main causes of death. There was no death due to LTB alone. These findings are similar to the findings on studies done on severe LTB in developing countries (50,67). All the dingins in this study confirm Wesley's findines that LTB in developing countries is a more severe disease than that managed in developed countries.

OCCLUSION

Laryrpotracheobronchitis patient5 formed the majority of admissions in ICU during the period of study, and their mortality was very high compared to similar studies done elsewhere. Many of these patients came to the hospital rather late for treatment. Many of these developed as a ccnplication of measles and were associated with malnutrition and belonged to the low socio-econcnic group of our population.

It is therefore suggested that mass irnunisation ccnpaigns against measles be stepped up in all pre-schoDi age children, and that general education on nutrition be encouraged. It is elso suggested that the severe fonns of this disease be identified and diagnosed early, for early admission to ICU and treatment, before complications arise.

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VABLE L

SEX DISTRIBUTION

SEX	NO. OF PATIENT	PERCENTAGE %
MALES	134	64.1
FEMALES	75	35.9
TOTAL	209	10CK

FIG, 1

AGE DISTRIBUTION

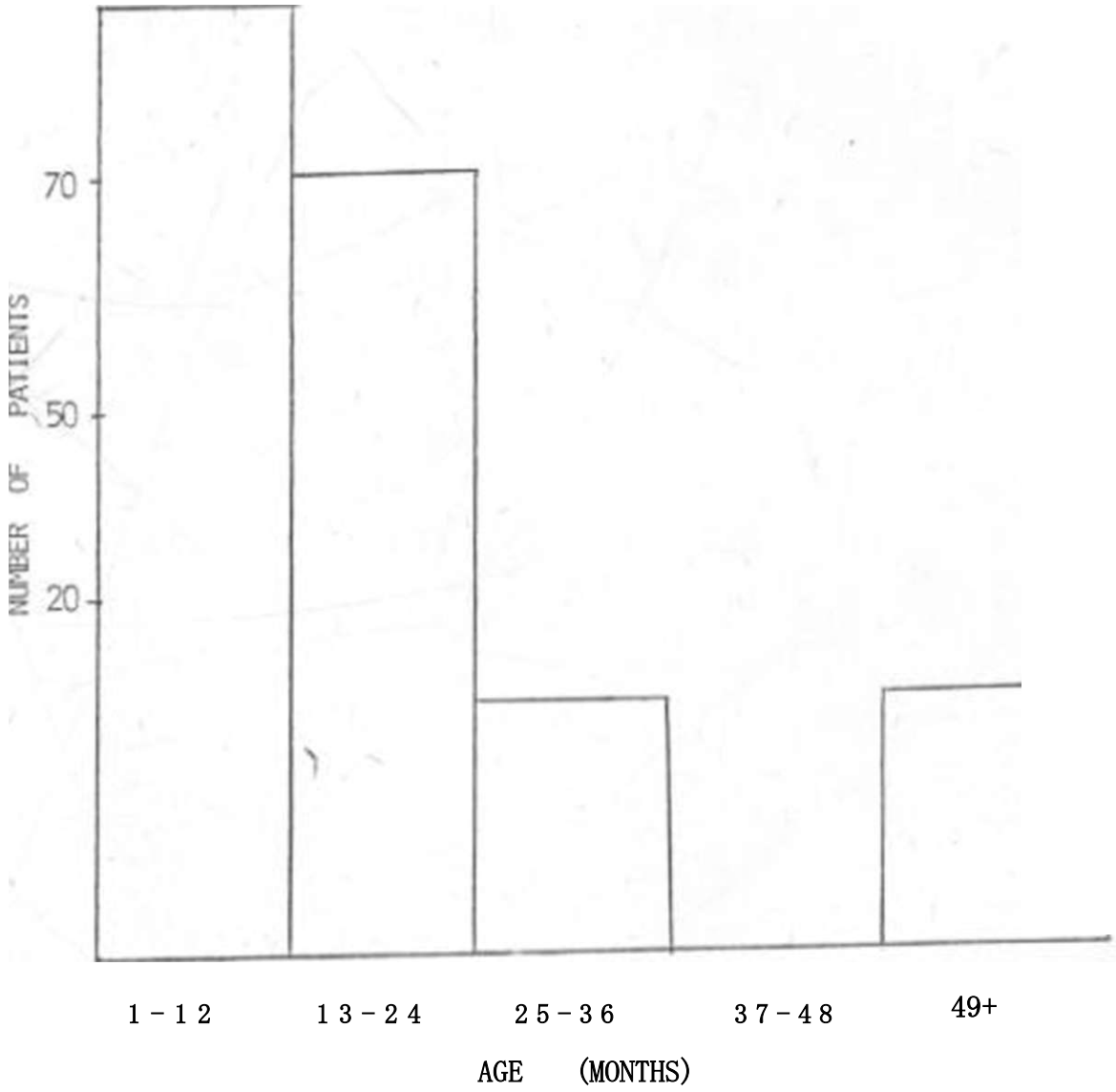

TABLE 2

THE AGE DISTRIBUTION

AGE ·MONTHS	NO. OF PATIENTS	PERCENTAGE (%)
1 - 12	92	IFL.O
13-21	75	35.9
25 - 36	21	10.0
37-48	6	2.9
	15	7.2
TOTAL	209	100%

TABLE 3

CAUSES OF LTB

LTB CAUSES	NO. OF PATIENTS	PERCENTAGE
POST-MEASLES	138	55.0
VIRAL	71	34.0
TOTAL	209	100%

%

TABLE ^

LTB GRADE ON ADMISSION

LTB GRADE	NO. OF PATIENTS	PERCENTAGE
I	0	0
II	25	12.4
III	154	73.7
IV	29	13:9
TOTAL	209	100%

/

TABLE 5.

RESULTS OF BGAs DONE ON ADMISSION

BGA RESULT	NO. OF PATIENTS	% OF BGAs (DONE ON' ADMISSION)
RESPIRATORY ALKALOSIS	27	42,9
METABOLIC ACIDOSIS	7	II.1
RESPIRATORY ACIDOSIS	5	7.9
HYPOXIA	6	9.5
ACCEPTABLE	19	30.2

Respiratory alkalosis i.e. P_a CO, less than

Respiratory acidosis i.e. CO_a more than 40nrflg.

Metabplic alkalosis or acidosis depending on FH, Base Excess or Deficit, serum bicarbonate (HCO,) levels.

Hypoxia: $^{p}{}_{a}$ h, i ess than 40mrilg with patient on ROOM air or less than 6fcnrcHg with the patient on oxygen.' .

TABLE 6

RESULTS OF SERIAL BGA

BGA RESULT	NO. OF PATIENTS	% OF SERIAL BGAS DONE
RESPIRATORY ALKALOSIS	135	21.2
ACCEPTABLE	113	19.2
HYPOXIA	101	17.1
RESPIRATORY ACIDOSIS	60	10.2
METABOLIC ALKALOSIS	58	9.8
METABOLIC ACIDOSIS	40	6.8

TABLE 7

COf-PLIGATING FACTORS ON AIT1SSIOE' TO 1, C. U.

COMPLICATION	NO. OF PATIENTS	I OF PATIENTS IN STUDY
BROCHOPNEUMONIA	66	31.6
CONGESTIVE CARDIAC FAILURE (CCH)	29	13.9
DIARRHOEA	21	10.0
DEHYDRATION	19	9.1
OTITIS MEDIA	12	5.7
KWASHIOKOR	11	5.3
STOMATITIS	9	4.3
ANAEMIA	6	2.9
MARASMJS	5	2.4
CONVULSIONS	4	1.9
HYPERPYREXIA		
CARDIAC ARREST (ONE)	3	1.4
BURNS		
SEPTICAEMIA	2	1.0
OTHERS	1	0.5

TABLE 8

AIRWAY KANAGEKErT ATO RESPIRATORY SLPPORT

RESPIRATORY S1PPORT	NO. OF PATIENTS	PERCENTAGE OF PATIENTS STUDIED
NO INTUBATION OR TRACHEOSTOMY DONE	25	12.0
OROTRACHEAL INTUBATION	1	0.5
NASOTRACHEAL INTUBATION	181	86.6
TRACHEOSTOMY ALONE DONE	2	1,0
TRACHEOSTOMY AND NASOTRACHEAL INTUBATION	14	6.7
ENDOTRACHEAL INTU3ATION AND T-PIECE OXYGEN	46	22.0
ENDOTRACHEAL INTUBATION/ STEAM AND OXYGEN TENT	124	59.3
MECHANICAL VENTILATION X IPPV	61	29.2
IPPV + PEEP	11	5.3

IPPV - Intermittent positive pressure ventilation

PEEP - Positive End Expiratory Pressure.

TABLE 9

DURATION OF NASOTRACHEAL 1MTUBATIGN

DURATION OF NASOTRACHEAL INTUBATION (DAYS)	NO, OF PATIENTS	% OF PATIENTS INTUBATED
1 - 5	76	42.0
6 - 10	53	29.0
11-20	li0	22.1
21 - 30	9	5.0
31-10	2	1.1
41+	1	0.6
TOTAL	181	100%

FIG. 2

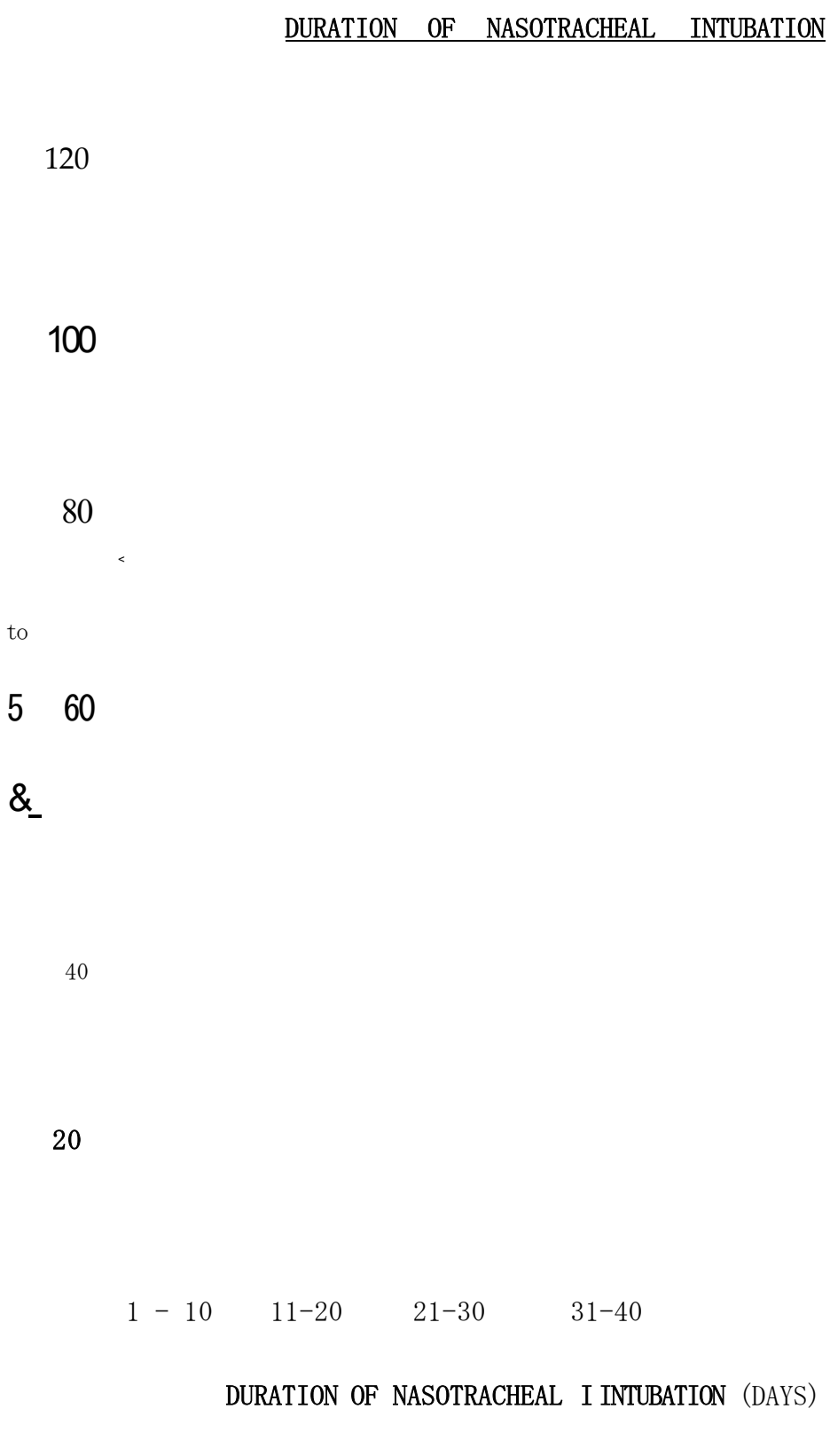
DURATION OF NASOTRACHEAL INTUBATION
120
100
80
60
40
20
1 - 10
11-20
21-30
31-40
DURATION OF NASOTRACHEAL I INTUBATION (DAYS)

TABLE 10.

COMPLICATIONS OF NASOTRACHEAL INTUBATION

COMPLICATION	NO. OF PATIENTS	% OF PATIENTS
LARYNGEAL STENOSIS REQUIRING DILATATIONS	6	3.3
LARYNGEAL PAPILLOMA	2	1.1
BLOCKAGE (AT LEAST ONCE)	44	24.3
REMOVAL OR DISLODGED TUBE (AT LEAST ONCE)	45	25.4

TABLE 11

INDICATIONS FOR TRACHEOSTOMY

INDICATION	NO, OF PATIENTS
FAILED INTUBATION	2
LONG DURATION OF INTUBATION	6
LARYNGEAL STENOSIS	*H*
OBSTRUCTED TYPE OF BREATHING EVEN AFTER ENDOTRACHEAL INTUBATION	3
? FOREIGN BODY	1

TABLE 12
r ;

COMPLICATION O[c] TRACHEOSTOMY

COFPLLCATION	NO, OF PATIENTS	Z OF PATIENTS WITH TRACHEOSTOMY
TRACHEAL STENOSIS	H	25 .0
LARYNGEAL PAPILLOF-'A	1	6.3
SURGICAL B-PHYSE>'A	1	6.3
BLEEDING	1	6.3
PNETWOTHORAX DUE TO DISPLACED TRACHEOSTOMY TUBE	1	6.3
BLOCKAGE (AT LEAST ONCE)	1	6.3

TABLE 13

COMPLICATIONS ARISIN3 IN I.C.U.

COT-PL I CATION	NO, OF PATIENTS	% OF PATIENTS IN STUDY
BRONCHOPNEUMONIA	58	27.-8
CONGESTIVE CARDIA FAILURE	47	22.8
DIARRHOEA	20	9.6
COTMJLSIONS	19	9.1
PERSISTENT FEVER	7	3.3
LUNG COLLAPSE	5	2.4
MENINGITIS, PNEUMOTHORAX	4	1.9
OTITIS MEDIA		
SEPTICAEMIA		
r ENCEPHALITIS	> 2	**1.0**
ORAL THRUSH		

TABLE 1M

SYSTEMIC ANTIBIOTICS USED

ANTIBIOTIC	NO. OF PATIENTS	% OF PATIENTS IN THE STUDY
CRYSTALLINE PENICILLIN (CRYSTAPEN)	108	51.7
GENTAMYCIN	73	35.0
AMP1C1LLIN	66	31.6
CHLORAM[3]:-HENICOL	23	11.0
KAMAKYCIN	23	11.0
AF-PICLOX -	21	**10.0**
SEPTRIN	18	8.6
CLOXACILLIN	1M	6.7
CEPHALOSPORIN	8	3.8
AMIKACIN	7	3.3
ANTITUBERCULOUS THERAPY (STREPTOWCIN, THIAZINA, INH)	6	2.9
PYOPEN	<4	1.9
LINCOMYCIN	3	*IA*
ERYTHROK/CIN		
CEFOTAXIME (CLAFORAN)		**1.0**
CEFATREXYL (DALACIN C)		
FLUCLOXAC1LLIN SODIUM (FLOXAPEN)		
PROCAINE PENICILLIN		0.5
TRIPLOPEN		
AMOXYCILLIN		

TABLE 14

SYSTEMIC ANTIBIOTICS USED

ANTIBIOTIC	NO. OF PATIENTS	% OF PATIENTS IN THE STUDY
CRYSTALLINE PENICILLIN (CRYSTAPEN)	1C8	51,7
GENTAWCIN	73	35,0
AMPICILLIN	55	31,6
CHLORAM[3]i-iEN I COL	23	11.0
KAf-WMYCIN	23	11.0
AMPICLOX	21	10.0
SEPTRIN	18	8.6
CLOXACILLIN	14	6.7
CEPHALOSPORIN	8	3.8
AMIKACIN	7	3.3
ANT I TUBERCULOUS THERAPY (STREPTOMYCIN, THIAZINA, 1NH)	6	2.9
PYOPEN	4	1.9
LINCOMYCIN	3	1.4
ERYTHROF-^CIN		
CEFOTAXIME (CLAFORAN)	2	1.0
CEFATREXYL (DALACIN C)		
FLUCLOXAC1LLIN SODIUM (FL0XAPEN)		
PROCAINE PENICILLIN	1	0.5
TRIPLOPEN		
AMOXYCILLIN		

TABLE 15

STEROIDS USED

TYPE OF STEROID	NO, OF PATIENTS	% OF TOTAL PATIENTS Of J STEROIDS
HYDROCORTISONE	101	51.6
PREDNISONE .	36	22.0
DEXWCTHASONE	24	14.6
SOLLJMEDRAL (KETHYIPREDNISOLCNE)	3	1.8
TOTAL	164	100%

TABLE 16

USE OF RACEMIC ADRENALINE

	NO I OF PATIENTS	* OF PA<I,J?[Y] IN THE *
RACEM1C ADRENALINE IPPB	37	]JJ
SUBCUTANEOUS ADRENAL1^		
NEBULIZED ISOPRENAL1NE		

v

TABLE 17

OTHER DRU3S USED

DRUG	NO. OF PATIENTS	5 OF PAT1^ IN STUD*
		49.3
DIAZEPAM	103	31.1
D1GOX1N	65	22.0
INDOCID (SIPPOSITORIES)		21.1
BROWEXIME (BISOLVON)	^	
FRUSEMIDE (LASIX)	30	iu.》
PARENTENOVITE I AT© II	30	13.9
TERBUTALINE (BRICANYL)	V 29	12.″
CHLOROGUINE	26	12.0
SALBUTAMOL (VENTOLIN)	25	10.0
DIPHENOXYLARE + ATROPINE (LOMOTIL)	21	9.*
PRCMETViAZlNE (PHENERGAN)	20	8 6
ACETYL SALICYLIC ACID (ASPIRIN)	18	*11*
MULTIVITE	16	

TABLE 17

OTHER DROSS USED

DRUG	NO, OF PATIENTS	% OF PATIENTS IN STUDY
DIAZEPAM	103	49.3
D1GOXIN	65	31.1
1ND0C1D (SUPPOSITORIES)	46	22.0
BRONHEXIME (BISCLVON)	44	21.1
FRUSEMIDE (LASIX)	30	14.4
PARENTENOVITE I AND II	30	14.4
TERBUTALINE (BRICANYL)	29	13.9
CHLOROQUINE	26	12.4
SALBUTAMOL (VENTOLIN)	25	12.0
DIPHENOXYLARE + ATROPINE (LOMOTIL)	21	10.0
PROMETHAZINE (PHENERSAN)	20	9.6
ACETYL SALICYLIC ACID (ASPIRIN)	18	8.6
MJLTIVITE	16	7.7

TABLE 18

APMˆw SFRIAL ELECTROLYTE

RESULT	NO. OF PATIENTS	% OF PATIENTS IN STUDY
(< 130 Mf-DL/L) HYPONATRAEMIA		1.0
KYPONATRAEM1A (>150 FTLCU L)		0.5
(< 3.0 MMOL/L) HYPOKALAEMIA		4.3
HYPERKALAEH1A (> 5.0 MMOL/L)		2.4
TOTAL	17	8.2

TABLE 19

SUCCESSFUL. TRIAL EXI1BATION

SUCCESSFUL TRIAL EXTUBATION	NO- OF PATIENTS	% OF PATIENTS INTUBATED AND DISOVVRGED ALIVE
FIRST	89	91.8
SECOND	3	3.1
THIRD	2	2.1
FOURTH	1	1.0
FIFTH	2	2.1
TOTAL	97	10CR

TABLE 20

RESULTS OP CULTL3E O[p] TRACHEAL ASPIRATES

ORGANISM to- ISOLATED	OF PAT I BfTS	% OF CULTURES
KLEBSIELLA	35	29.0
PSEUDOMDNAS	27	21.8
STAPHYLOCOCCUS AUREUS	21	17.0
PROTEUS	12	9.7
CITRCBACTER	9	7.3
E. COLI	6	4.8
STAPHYLOCOCCUS ALBUS		3.2
ENTEROBACTER	3	2,4
ACINETOBACTERIA	2	1.6
ALKALI GENES FAEC/U-IS	1	0.8
PKEUMOCOCCI	1	0.8
P - HEAMOLYTIC	1	0.8
STREPTOCOCCUS	1	0.8

TABLE 21

DISTRIBUTION 0= 1 C.U STAY

STAY IN 1.C.U. (DAYS)	NO. Or PATIENTS	PERCENTAGE
1 - 5	74	35,4
6 - 10	58	27.8
11 - 20	53	25A
21 - 30	14	6.7
31 - 40	3	2.9
41 - 50	0	0
51 +	4	1.9
TOTAL	209	100%

FIG. 3 MIRATIOK CP I.C.U. STAY

TABLE 22

CAUSLS OP CEATH

CAUSE	NO. OF PATIENTS	% OF PATIENTS WHO DIED
BRONCHOPNEUMONIA AND CCF	86	91.5
HYPOXIC BRAIN DEATH	5	5.3
MARASMUS	2	2.1
OTHERS	1	1.1
TOTAL	94	103%

KANAflEKgv'T OF LT? PATIENTS IN K.N.H. .1.C.C.

197? - 198^.

IATA COLLECTION FORM: STUDY NO:

NAME. . . . . I.P. NO

LTB GRADE. . . . . ANT CAUSE:

A.E. . . . . ZZX . . . . . WEIGHT

A. :TTL. FRO

ADMISSION D>TE

CISCRAJ^E/DEATH DJTE

DURATION OF I.C.U. STAT. . . . . (DAYS)J

COMPLICATING /ACTORS (ON ADMISSION)

4

COMPLICATIONS IN I.C.U

1.1.V. I *N QEMEH1:

,-NTIBIOTICS

OK ADMISSION BGA:

PH

p《co_2

P®O_2

so_2

HCO_3

BE

SERIAL BOA:

DATE_____FESULTS.

1

2
>

)
5

OTHER COMMITS: