A Study on the Aetiology of Pneumonia in Cairo and Tanta University Hospitals: A Bacteriologic Approach

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ABSTRACT

One hundred and sixty cases of "pneumonia" with proved clinical and radiological evidence from the Chest Departments in Cairo and Tanta University Hospitals during the year 2007, were the subjects of a conventional bacteriologic study having in mind the empirical approach in the antibiotic therapy. They represented 4.06% of the yearly admissions. The major age incidence was 16 year with more ♂ sex predilection. 92.5% belonged to CAP (community acquired pneumonia) and only 7.5% to HAP (hospital acquired pneumonia), VAP (ventilator associated pneumonia) being excluded. 80.6% were primary; with no antedating pathology in the patients, while 19.4% were secondary with co-morbidity in such patients; out which malignancy and COPD were the main associations in older age groups and foreign body in younger ages. The causative organisms were bacteriologically identified only in 53.7% of cases. The main organism in the causation of CAP was *Streptococcus pneumoniae* in 51.7% of the cases, followed by *Hemophilus influenzae* in 15.5%, while in HAP, 2 major organisms were responsible for the disease; namely *Streptococcus pneumoniae* and *Klebsiella pneumoniae*; 33.3% for each, followed by *Hemophilus influenzae* and *Streptococcus pyogenes*; 11.1% for each, but the number of cases in HAP is too small to draw valid conclusions. The organism detected, in primary pneumonia was also essentially *Streptococcus pneumoniae* 57.6%, while in secondary pneumonia the same organism was encountered in only 33.3% of the cases. Concerning the lobar and lobular distribution of the disease the *S. pneumoniae* was overwhelming in the lobar type: 84.2%, while in the lobular bronchopneumonic type the main organisms, besides *S. pneumoniae* which was responsible for 22.2% of the cases were *S. pyogenes* was responsible for one quarter of the cases and *H. influenzae* which was encountered in 22.2%. Figures for other organisms are detailed in the text with their relation to other parameters of the study.

INTRODUCTION

Pneumonia as an inflammation of the lung, caused by acute respiratory infection ranks as the 6th among the causes of death in the World, by the end the last century [1]. It is expected, if not properly attended to, to at least maintain this rank in the current years. The pathogens causing the disease have regional differences as shown in foreign literature [2, 3]. Risk factors of ventilator associated pneumonia in ICU were reported on by Gehan et al.[4]. A meta-analysis on Microbial and Sensitivity in hospital acquired pneumonia during the past few years in Egypt was published by Gamal et al. [5]. The rather new classification of pneumonia according to its source of origin into community- acquired and hospital-acquired received international recognition to supercede the older classifications into lobar and lobular or Bronchopneumonia and also, typical and atypical forms. The classification into primary, and secondary still holds, in order not to over look antedating important pathology or a co-morbidity in the etiology on the way of its proper management [3]. The microbiologic parameter, remains however, the cornerstone in the etiologic classification and has its definite bearing on the antibiotic treatment; the main item in its management [6]. Thus, in view of the diverse attitude encountered in the literature, the objective of the present study carried out in two leading University hospitals in Egypt: namely Cairo University and Tanta University, was to throw light on its present bacteriologic situation and its possible relation to the different classifications of the disease, thus reflecting its bearing on the treatment which usually starts empirically and may also be continued on the same empirical basis guided by impressions that need to the rectified on scientific background, essentially microbiologic and in particular in its bacteriologic aspect.

PATIENTS AND METHODS

One hundred and sixty patients having pneumonia were the subjects of the present study. They were attending both Cairo and Tanta University hospitals and diagnosed by the Chest Departments in either hospital, during the whole year of 2007. Their age ranged from 8 to 66 years.

They included 90 males and 70 females. They were subjected to careful history taking and clinical examination. X-ray of the chest was always done. Other appropriate investigations were carried out in the particular patient; in case where secondary pneumonia was suspected; specially CT Chest and Bronchoscopy, besides routine investigations. Cases admitted to the Intensive Care Unit (ICU), who developed ventilator associated pneumonia were excluded, because of the critical health status not feasible for exhaustive investigations. The bacteriologic examination was carried out on samples of the genuine sputum collected from every case. For specimen collection, the patient should brush his/her teeth and/or rinse mouth well with water before attempting to collect the specimen to reduce the possibility of contamination the specimen with food particles, oropharyngeal secretions, etc. The sputum should be expectorated into a sterile container. After the sputum has been collected, the specimen was examined to make sure it contains a sufficient quantity (at least 1 mL) of thick mucus (not saliva). The limitations of such approach include the fact that an adequate sputum specimen should contain many neutrophils and few to no squamous epithelial cells. The latter are indicative of contamination with salvia. Results obtained by culture without evaluation for contamination may be noncontributory or misleading [(7)]. For example a Gram stain from a carefully collected specimen, with neutrophils would show the lancet-shaped diplococci staining gram-positive, which are intracellular or encapsulated, thus providing strong support to the clinical diagnosis of pneumococcal pneumonia [(8)].

Conventional standard microbiologic methods are applied before the start of antibiotic therapy. Isolates were defined according to the morphologic culture on blood agar and MacConkey's agar, and Biochemical and Serological characteristics [(6, 7)].

The isolation and identification of the organisms were performed according to the routine bacteriological methods. Agents such as *Chlamydia pneumoniae, Hemophilus influenza* and *Mycoplasma pneumoniae* require special laboratory measures for isolation. *Chlamydia pneumoniae* was identified by microimmunofluorescence technique (MIF) for C. pneumoniae IgG antibody testing. The cut-off titre used for a positive test was 32. *Hemophilus influenza* was identified by culture on chocolate agar and its requirement for X and V factors and by its lack of hemolysis on blood agar. *Mycoplasma pneumoniae* was identified by culture on arginine broth, SP-4 broth, and mycoplasma broth and agar for the isolation of conventional mycoplasmas. Agar plates were incubated at 37˚C in a 10% carbon dioxide environment and were examined weekly over an 8-week period [(8- 10)].

RESULTS

The total number of attendants in the Chest Department in Cairo and Tanta University Hospitals during the study year was 3940 cases, out of them 160 had pneumonia and were included in the study; giving an incidence of 4.06%. Results of the pneumonia cases are shown in tables (1-12 inclusive).

Table (1): Age and sex distribution (n=160)

Age (years)	Sex				Total	
	Males		Females			
	No.	%	No.	%	No.	%
<16	48	53.4	29	41.4	77	48.1
16-30	13	14.4	14	20.0	27	16.9
30-45	8	8.8	13	18.6	21	13.1
45-60	8	8.8	4	5.7	12	7.5
>60	13	14.4	10	14.3	23	14.4
Total	90	99.8	70	100.0	160	100.0

Table (2): Distribution of cases according to type (according to the location of the start of the disease) (n=160)

Item	Community acquired pneumonia (CAP)	Hospital acquired pneumonia (HAP	Total
No	148	12	160
%	92.5	7.5	100.0

Table (3): Distribution of cases according to pathologic etiology(n=160)

Item	Primary	Secondary (antedating pathology)	Total
No	129	31	160
%	80.6	19.4	100.0

Table (4): Classification according to anatomic location

Item	Lobar*	Lobular or bronchopneumonia**	Unclassified***	Total
No	29	109	12	160
%	24.4	68.1	7.5	100.0

* One case was bilateral (2.5%) of its group
** 13 cases were bilateral (11.0%) of its group
*** 2 cases were bilateral (16.6%) of its group
} Total bilateral cases 16 (10%)

Table (5): Classification according to bacteriologic etiology*

Item	No.	%	
*Streptococcus pneumoniae***	43	50	
*Staphylococcus aureus***	6	6.9	gram +ve
*Streptococcus pyogenes****	9	10.5	
*Hemophylus influenzae*****	13	15.1	
Klebsiella pneumoniae	5	5.8	
Pseudomonas aeruginosa	1	1.2	gram -ve
Proteus mirabilis	2	2.3	
Mycoplasma pneumoniae	4	4.6	
Chlamydia pneumoniae	3	3.5	
Total identified	86	53.7	
Unidentified	74	46.3	
Grand total	160	100.0	

*According to main overwhelming presence of an organism. Mixed infection was however encountered in 13 cases, but the existence of the other organisms responsible for the mixed infection was very scanty and hence was overlooked in favour of the markedly predominant organism
** No cases of MRSA were encountered (Methicillin resistant strains)
*** Among which 2 cases were having mixed infection
**** Among which 7 cases were having mixed infection
***** Among which 4 cases were having mixed infection

Table (6): Identified organisms according to age (n=86)

Item	Age (years)						Total	
	<16		16-60		>60			
	No	%	No	%	No	%	No	%
Strept. pneumoniae	12	48	27	62.8	4	22.2	43	50.0
Staph. aureus	5	28	1	2.3	0	0	6	6.9
Strept. pyogenes	2	8	1	2.3	6	33.3	9	10.5
H. influenzae	4	16	5	11.6	4	22.2	13	15.1
K. pneumoniae	2	8	2	4.6	1	5.5	5	5.8
Ps. aeruginosa	0	0	1	2.3	0	0	1	1.2
Pr. mirabilis	0	0	1	2.3	1	5.5	2	2.3
M. pneumoniae	0	0	3	7.0	1	5.5	4	4.6
C. pneumoniae	0	0	2	4.6	1	5.5	3	3.5
Total identified	25	100	43	99.9	18	99.8	86	99.9

Table (7): Identified organisms according to sex (n=86)

Item	♂		♀		Total	
	No	%	No	%	No	%
Strept. pneumoniae	22	45.8	21	55.2	43	50.0
Staph. aureus	3	6.2	3	7.9	6	6.9
Strept. pyogenes	5	10.4	4	10.5	9	10.5
H. influenzae	8	16.6	5	13.1	13	15.1
K. pneumoniae	3	6.2	2	5.3	5	5.8
Ps. aeruginosa	1	2.1	0	0	1	1.2
Pr. mirabitis	2	4.2	0	0	2	2.3
M. pneumoniae	2	4.2	2	5.3	4	4.6
C. pneumoniae	2	4.2	1	2.6	3	3.5
Total	48*	99.9	38**	99.9	86	99.9

* Among which 8 cases were having mixed infection
** Among which 5 cases were having mixed infection

Table (8): Identified organisms according to start of the disease (n=86)

Item	CAP		HAP		Total	
	No	%	No	%	No	%
Strept. pneumoniae	40	51.6	3	33.3	43	50.0
Staph. aureus	6	7.7	0	0	6	6.9
Strept. pyogenes	8	10.2	1	11.1	9	10.5
H. influenzae	12	15.4	1	11.1	13	15.1
K. pneumoniae	2	2.6	3	33.3	5	5.8
Ps. aeruginosa	1	1.3	0	0	1	1.2
Pr. mirabilis	1	1.3	1	11.1	2	2.3
M. pneumoniae	4	5.1	0	0	4	4.6
C. pneumoniae	3	3.9	0	0	3	3.5
Total	77*	100.0	9**	99.9	86	99.9

* Among which 10 cases were having mixed infection
** Among which 3 cases were having mixed infection

Table (9): Identified organisms according to antedating pathologic etiology (n=86)

Item	Primary pneumonia		Secondary pneumonia		Total	
	No	%	No	%	No	%
Strept. pneumoniae	34	57.6	9	33.3	43	50.0
Staph. aureus	4	6.8	2	7.4	6	6.9
Strept. pyogenes	6	10.2	3	11.1	9	10.5
H. influenzae	8	13.6	5	18.5	13	15.1
K. pneumoniae	3	5.1	2	7.4	5	5.8
Ps. aeruginosa	0	0	1	3.7	1	1.2
Pr. mirabilis	1	1.7	1	3.7	2	2.3
M. pneumoniae	2	3.4	2	7.4	4	4.6
C. pneumoniae	1	1.7	2	7.4	3	3.5
Total	59*	100.1	27**	99.9	86	99.9

* Among which 9 cases were having mixed infection
** Among which 4 cases were having mixed infection

Table (10): Identified organisms according to anatomical location (n=86)

Item	Lobar		Broncho-pneumonia		Unclassified		Total	
	No	%	No	%	No	%	No	%
Strept. pneumoniae	32	84.1	8	22.2	3	25.0	43	50.0
Staph. aureus	1	2.8	3	8.3	2	16.6	6	6.9
Strept. pyogenes	0	0	9	25.0	0	0	9	10.5
H. influenzae	4	10.4	8	22.2	1	8.4	13	15.1
K. pneumoniae	0	0	3	8.3	2	16.6	5	5.8
Ps. aeruginosa	0	0	1	2.7	0	0	1	1.2
Pr. mirabilis	1	2.8	1	2.7	0	0	2	2.3
M. pneumoniae	0	0	2	5.5	2	16.6	4	4.6
C. pneumoniae	0	0	1	2.7	2	16.6	3	3.5
Total	38*	100.1	36**	99.8	27**	9.8	86	99.9

* No mixed infection was encountered
** Among which 8 mixed infection was encountered
*** Among which 5 mixed infection was encountered

Table (11): Monthly distribution of identified organism (n=86)

Item	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
S.pneumoniae	12	3	1	0	0	0	0	0	2	4	5	16	43
S. aureus	2	1	0	0	0	0	0	0	0	0	1	2	6
S. pyogenes	3	0	0	0	0	0	0	0	0	1	1	4	9
H.influenzae	2	1	1	0	0	0	0	0	1	3	1	4	13
K.pneumoniae	0	0	0	0	0	0	0	0	0	0	0	0	0
Ps.aeruginosa	3	1	1	0	0	0	0	0	1	2	2	5	15
Pr. mirabilis	0	0	0	0	0	0	0	0	0	0	0	0	0
M.pneumoniae	0	0	0	0	0	0	0	0	0	0	0	0	0
C.pneumoniae	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	22*	6	3	0	0	0	0	0	4	10**	10**	31***	86

* Among which 5 cases were having mixed infection
** Among which one case were having mixed infection
*** Among which 7 cases were having mixed infection

Table (12): Antedating pathology in secondary pneumonia according to age (n=31)

Item	Age (years)							
	<16		16-60		>60		Total	
	No	%	No	%	No	%	No	%
Malignancy	0	0	2	22.2	6	37.5	8	25.8
Asthma and/or COPD	0	0	2	22.2	8	50.0	10	32.2
Congenital anomaly	1	16.6	0	0	0	0	1	3.2
Foreign body	2	33.3	0	0	0	0	2	6.4
Exanthemata	2	33.3	0	0	0	0	2	6.4
Diabetes	1	16.6	4	44.4	1	6.2	6	19.4
Others	0	0	1	11.1	1	6.2	2	6.4
Total	6	99.8	9	99.9	16	99.9	31	99.8

DISCUSSION

The bacteriologic approach to "pneumonia" was the main objective of the present study. It is felt to be an integral part of the fight against lower respiratory tract infection in its acute, possibly fulminant state, specially that it is harmful as a cause of morbidity and mortality all over the World [(1)]. Its relative incidence varies from one part of the World to the other [(8)]. In Egypt in particular, there is no available reliable nation wide statistics about it. Most of the knowledge about the subject is gained from shreds of information in particular localities which can not be extended to other localities. Of these is the exhaustive meta-analysis for Hospital Acquired Pneumonia (HAP) published by Gamal et al.[(5)]. It included analysis of 31 papers done in Egypt of which: 19 papers were done in Ain-Shams Hospital and a smaller number in Kasr Al-Aini (5 papers) and 2 papers from Azhar and one paper from medical institutions each of Police hospital, Suez Canal, Mansoura, Banha and Alexandria

sites. Tanta inspite of being one of the main University Hospitals; right in the heart of lower Egypt (Delta); was not included. The contribution in that meta-analysis on the topic by the Cairo University Hospitals; inspite of its being the oldest of such hospitals did not include its Chest Department. These 2 centers were the source of patients in the present study. Treatment of pneumonia, to the moment, starts, and may also be continued, on empirical basis, without adequate information about the causative organism. Such information when available by investigations like those done in the present communication, would help a lot the proper management, fetching for fruitful therapeutic results, and avoidance of waste of antibiotics and the development of resistance to these empirically used antibiotics which would reflect itself on the response of the patient himself and on future management of similar and other cases.

Concerning the studied cases, it included all the attending cases diagnosed as pneumonia in both localities whether Community Acquired Pneumonia (CAP), developing before attending the hospital care or developed pneumonia while being as in-patients in the Departments of Chest Diseases in the Cairo and Tanta University Hospitals (HAP). They were 160 cases in all, out of 3940 attendants during the study year 2007 (4.06%). Out of these 97 were belonging to Cairo University hospital, out of 2730 attendants (3.3%) and the remaining 63 were belonging to Tanta Hospital, out of 1210 attendants (5.2%). The difference is statistically significant ($P<0.05$), indicating a possible geographic and social discrimination. These figures are more than those mentioned in other Egyptian meta-analysis sources (1.6%)[4,5], again possibly because of geographical and social reasons, besides their cases were mostly the more critical ventilator associated pneumonia (VAP), while such critical cases were excluded from the present study. Such critical VAP cases are not that frequent and thus would not show a higher incidence when compared the usual more common non-fulminant cases of CAP and HAP, and hence not necessitating intensive care and assisted ventilation. The cases admitted to the intensive care unit, were excluded from the present study because of their critical health status. The duration of the study was one complete year, starting from the beginning of January and up to the end of December of the year 2007. The number of cases distributed over the 12 months of the year shows that the maximum incidence was in the Winter and Autumn seasons from October to February inclusive representing 140 cases of the total or 79 of the identified cases (91.8%) leaving only 20 cases of the total or 7 of the identified cases (8.2%) for the Spring and Summer seasons, starting from March to September inclusive (Table11). This is obvious because of the cold damp whether and the possible use of artificial inadequate, unwholesome and polluting traditional methods of heating, specially outside the capital; namely Cairo. It seems definite that pneumonia, with its classical profile, is a disease of the cold damp season, rather the hot dry one. This statement also applies to the more common organisms being more prevalent in the common season. This is accordance with Likermann et al.[4]. The clinical and radiological findings in the diagnosed cases included adequate history taking and physical examination. PA and lateral views of the chest were always done to document the diagnosis. CT chest was rarely resorted to except in some particular cases; when the standard films were not adequately informative. The bacteriologic study was carried out according to the classical standard conventional approach. When secondary pneumonia were suspected, other related investigations were done. Every effort was done to disclose the causative organism and minimize the entity of unidentified. The organisms looked for included gram positive bacteria, like *S. aureus*, *S. pyogenes*, *S. pneumoniae* and also gram negative organisms like *K. pneumoniae, P. aeruginosa, P. mirabilis, E. coli* and *H. influenzae*. Other atypical organisms like *Mycoplasma pneumoniae*, *Legionella pneumophilus* and *Chlamydia* species were also looked for. Viral etiology of the disease which was not the topic of the present study may be a cause among those with unidentified bacteria. The results refer to an increased incidence in males than females (90 cases versus 70 cases respectively) (Table 1). This could be attributed to the more outward cold and damp exposure of males groups in such communities. After that age and up to 45 years of age females showed more incidence, may be due to unwholesome indoor heating. A more important explanation however is reached from table (2); where community acquired pneumonia (CAP) incidence was markedly higher than Hospital acquired pneumonia (HAP); figures being 92.5% and 7.5% respectively indicating a fact that refers to better hygienic conditions in the hospitals. HAP was delineated as starting after the lapse of 72 hours after admission to hospital, in a previously chest free patient on admission, while CAP started while the patient was outside the hospital, contracting the infection from his or her possibly polluted environments in the community, where the hygienic aspects may not be up to the desired level. Table (3), on the other hand, gives a figure of 19.4% of the pneumonia cases as being secondary to an antedating co-morbidity in the chest or elsewhere, which, as shown in table (12), vary according to age, malignancy and asthma and/or COPD overlap cases were encountered in

older ages. No pneumonia complicating asthma cases were encountered below 16 years possibly because infection in this age is essentially viral which was not attended to in the present study. Salem et al.[11] reported on Chlamydia infection in asthmatic patients. It is suggested that every effort should be done to detect antedating pathology in pneumonia patients before designating the case as being primary pneumonia. Diabetes should be looked for. In children, however, a foreign body inhalation or a congenital anomaly should be considered as was encountered in 4 patients in this series. The older anatomic classification of pneumonia into lobar and lobular or bronchopneumonia, as found in table (4), when correlated with table (10), showing the bacteriologic aetiology of their types, refers to a much higher incidence of *S. pneumoniae* in the lobar type (84.1%). This was a rather standard classical knowledge as referred to by Salem et al. [12]. Both *S. pyogenes* together with *H. influenzae* and *S. pneumoniae* share in the aetiology of bronchopneumonia; figures being 25.0%, 22.2% and 22.2% respectively. This may have a bearing on the antibiotic management of such cases, specially when their empirical use is to be started, before any bacteriologic scrutiny. Hence it is suggested not to drop the anatomic classification of the pneumonia into lobar and lobular or bronchopneumonia into disuse, in favor of the newer classification into CAP and HAP according to the environmental date of the start of the disease, specially that lobar pneumonia can be unilateral and bronchopneumonia is usually bilateral (Table 4). The anatomic unclassified group in pneumonia, although few in number (only 7.5%), may show radiological shadows apart from classical consolidation; like infiltrations or cavitation and may have especial bacteriologic etiology in the form of other organisms like Staphylococcus, Mycoplasma, Chlamydia and Klebsiella (16.6% each) as shown in table 10. This finding adds to the need not to drop the classic radiological classification of the pneumonia into disrepute, as such cases in the empirical therapy are in utmost need for another class of antibiotics for their proper management.

To continue the discussion of the bacteriologic approach in this study, strangely enough, as shown in table (5), in 46.3% of the cases of pneumonia it was not possible to identify the causative organism, leaving only almost half of the cases in the present study as identifiable. The cause, inspite of the security of the methodology applied in the investigation, may be a viral etiology for the infection. *S. pneumoniae* was responsible for half of the identified cases (50%) followed by *H. influenzae* in 15.1% and *S. pyogenes* in 10.5% (Table 5). Other causes varied from 6.9%, 5.8%, 4.6% and 3.5% in *S. aureus, Klebsiella, Mycoplasma* and *Chlamydia*, respectively (Table 5). The relative incidence varied according to age as shown in table (6). An analogous trend is shown in table (7), concerning the sex incidence.

Concerning the more recent classification of pneumonia into CAP and HAP, table (8) shows the bacteriologic aetiology in such cases, where a main organism was identified: *S. pneumoniae* was responsible for more than half the cases of CAP, while it was only responsible for one third of cases of HAP, bearing in mind that the total number of the latter (HAP) is only 12 cases when compared to the total number of CAP; being 148, while among the identified cases which had a number of 77 as being CAP, when compared to only 9 as being HAP. The small number represents a real difficulty to draw any valid conclusions in this respect, at least as far as HAP is concerned.

While table (3) refers to the primary and secondary types of pneumonia, table (12) correlates it with the age. On the other hand, table (9), shows this point from the bacteriologic point of view: *S. pneumoniae* was responsible for 57.6% of the primary cases and 33.3% of the secondary cases. *S. pyogenes* is almost equally distributed between both groups: 10.2% and 11.1%, respectively. *H. influenzae* was more responsible for the secondary types as compared to the primary; figures being 18.5% and 13.6% respectively. Other organisms, in spite of their responsibility for a small number of cases in either group, show an increased incidence in the secondary types (Table 9). The bearing of such finding again on the empirical therapy, for pneumonia in such cases is stressed when choosing the proper antibiotic, having in mind the need to attend to the treatment of the primary pathology as well, in the secondary cases.

Table (5) shows the organism, of overwhelming presence, detected in the specimens examined, which was identified only in 86% cases (53.7%), of which 13 only showed mixed infection with other organisms but the presence of these other organisms was scanty and hence was overlooked and the etiology was included among the entity of the more obvious presence of the concerned organism with overwhelming prevalence. Accordingly *S. pneumoniae* was responsible for half of the whole number of identified cases, being present in 43 cases; of whom 3 only were HAP and 40 were CAP (51.6%) as shown in table (8). The next common organism was *H. influenzae* responsible for 13 cases (15.4%) of cases; of whom 12 cases were CAP and only one case was HAP. The next organism was *S. pyogenes* responsible for 9 (10.5%) of the total cases; of whom 8 cases were CAP and only one case HAP. *K. pneumoniae* was the only organism that causes more cases of HAP

(3 cases) than CAP (2 cases), but the number of cases is too small to draw valid conclusions. *Mycoplasma* and *Chlamydia* were responsible only for 4 and 3 cases respectively of CAP group and did not figure in the HAP group. *P. aerugenosa* caused only one case of CAP, while the Proteus species caused one case in each of CAP and HAP. The figures in this series can not be compared with other Egyptian figures [4,5], which concentrated on ventilator associated pneumonia: Even when attending to HAP, the figures in the literature did not refer to patients presenting to specialized chest departments, as conducted in the present study. The present study also concentrated, on the major type of pneumonia i.e. CAP, as it was not adequately attended in the available previous publications [4,5].

The relation of the bacteriologic etiology of the pneumonia to the antedating pathology, is seen in table (9) which showed a predominant incidence of *S. pneumoniae* in 57.6% of primary cases while it was responsible for 9 cases (33.3%) in the secondary cases. This was followed by *H. influenzae* responsible for 18.5% of the secondary type and 13.6% of the primary cases. *S. pyogenes* was responsible for 10.2% and 11.1% of the primary and secondary cases respectively, while *S. aureus* was responsible for 6.8% and 7.4% of primary and secondary cases respectively. Other organisms were rarely encountered e.g. *Mycoplasma* caused 2 cases in either group, while *Klebsiella* caused 3 cases in the primary group and 2 cases in the secondary group. *Chlamydia* caused 2 cases in the secondary group and only one case in the primary group. *Pseudomonas*, on the other hand, caused only one case in the secondary group. But the number of cases is too small to draw any valid conclusions.

Table (10) represents a real addendum to the available previous Egyptian publications [4, 5]. This addendum refers to the fact that i.e. the anatomic distribution of the pneumonia processes dropped into disrepute, in foreign literature [2-4], although in the present series it seems to have a definite relation to the bacteriologic parameter: The *S. pneumoniae* was responsible for 84.1% of the lobar type of pneumonia, while the *S. pyogenes* and *H. influenzae* shared with it in the causation of bronchopneumonia being responsible for 25.0%, 22.2% and 22.2% of cases respectively, i.e. almost three quarters of such cases (Table 10). In the radiological unclassified cases the *S. pneumoniae* was responsible for 3 cases, while each of *S. aureus, Mycoplasma, Klebsiella* and *Chlamydia* caused 2 cases, one case only was due to *H. influenzae*. As a last relation between the bacteriology of pneumonia and either age and sex (Tables 6 and 7) were presented: Table (6) points to the fact that under the age of 16 years 48% of the cases were due to *S. pneumoniae* which was also causative in 62.8% of cases belonging to the age group 16-60 years and 22.2% in those above the age of 60 years. In this last age group *S. pyogenes* was responsible for one third of the cases, while the *S. aureus* was responsible for 22.2% of the cases. Concerning the sex, as shown in table (7), the *S. pneumoniae* was almost equally responsible for the causation of pneumonia in either sex (22 females and 21 males), representing 45% and 55.2% respectively. The same applies to *S. pyogenes* (10.4% ♂ and 10.5 ♀). *H. influenzae*, on the other hand, was responsible for the pneumonia in 16.6% of males and 13.1% in females, while *Klebsiella* caused 6.2% in ♂ and 5.3% in ♀. Other organisms contributed sporadically to the causation in either sex. These figures were comparable with those reported by Ruiz et al regarding the relation of the aetiology of pneumonia with the age and sex of the patients [13].

Conclusions and Recommendations:

- A major defect was encountered in the microbiologic detection of the causative organism in pneumonia cases (only 46.3%), specially CAP, which as a definite entity was overlooked in previous literature, and hence the treatment is empirical. More prompt search for the microbial etiology of the disease is needed. Besides it is also needed to extend the study to other centers, specially in upper Egypt, and if possible, a national approach to the problem is suggested. Bigger numbers of cases, specially of HAP must be studied. *S. pneumoniae* was the more prevalent organism in the causation of pneumonia with figures ranging from 51.7% in CAP, 57.6% in primary pneumonia and up to 84.2% in cases with lobar distribution, followed by *H. influenzae* and *S. pyogenes* in CAP 15.5% and 10.3% respectively. HAP, on the other hand, showed *K. pneumoniae* and *S. pneumoniae* in its causation in (33.3% for each). In bronchopneumonia, however, the main organism was *S. pyogenes*: 25%, followed by *H. influenzae* and *S. pneumoniae* (22.2% for each).
- The reflection of such finding on the factual treatment renders the therapy to be empirical, to start with, until the resistance pattern is studied as well, which is a recommendation for future study.
- Mixed infection does not seem to be a major happening, hence combination of antibiotics is not recommended in non-fulminant cases

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