ORIGINAL ARTICLE

INCIDENCE OF METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS IN PESHAWAR

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Background: There is considerable variation in the percentage of isolates of methicillin resistant *Staphylococcus aureus* (MRSA). There are several mechanisms for methicillin resistance. The most important is low affinity of penicillin binding proteins for β-lactam antibiotics. The objectives of this study were to establish the pattern of MRSA incidence in Peshawar in recent years, and to identify high risk groups for acquiring infection amongst the city population. **Method:** All positive MRSA cases reported at city laboratory were employed in the study. These were recorded over the time period elapsing from 2009 to 2011. For each patient, records were looked at for age, sex, specimen tested positive, hospital/community acquired and if hospital acquired then which particular hospital within the city was infection contracted at. Also patient records were addressed for any immune system abnormalities, any operation conducted, presence or absence of diabetes and any history of intravenous drug use. **Results:** There were a total of 929 MRSA cases in our study, of which 538 were males and 391 were females. MRSA frequency for the year 2009 was 207, for 2010 it was 284 and for 2011 it was 438. The frequency of MRSA increased by 54% from the year 2009 to 2011. **Conclusion:** A potentially alarming increase in MRSA incidence within the city has been observed in recent years threatening to rise further judging the current trend. Those at a high risk of contracting infection include males aged between 20–29 years, hospitalised, diabetics, immune system compromised, and individuals with a history of IV drug use.

Keywords: MRSA, Incidence, Prevention

INTRODUCTION

From different set ups, it is evident that there is considerable variation in the percentage of isolates of methicillin resistant *Staphylococcus aureus* (MRSA). The difference in prevalence may be due to different practises and policies prevailing in different hospitals, even, in given areas.[1] There are several mechanisms for methicillin resistance. The most important is low affinity of penicillin binding proteins for β-lactam antibiotics. This effect is determined by several structural genes for example Mec T. Another known mechanism may be the hyper-production of penicillaminase enzyme.[2] Methicillin resistant *Staphylococcus aureus* isolates were first recognised in the 1960s.[3] The bacterium Methicillin-Resistant *Staphylococcus aureus* (MRSA) is the etiological agent for a variety of human acquired infections for which treatment has proven significant difficulty. Its rising global incidence is a prime concern for the destabilisation of public health. A significant volume of world-wide studies have depicted this pattern of increase; Fankhauser and Schrenzel have shown a growing incidence of MRSA in Geneva from 2000 onwards with a small but insignificant reduction after 2008 from 30% to 23% in 2011 amongst *S. aureus* blood cultures tested.[4] Similar findings have been reported in other major European countries as that for Geneva; the office for national statistics in the UK published in 2010 that the number of MRSA related deaths increased steadily from 1993 to 2006 with a decrease by 37% in 2009 to 781 from 1,230 in 2008.[5] This still nonetheless is insufficient to significantly reduce the MRSA transmission risk, however, the moderate decline resulting from adoption of numerous control strategies could prove more effective in years to come.

The magnitude of MRSA incidence in Asia occupies a lower level in contrast to Europe and the United States.[6] Taking Iran as a reference for South-East Asia, multiple studies have shown that the country is experiencing a rise.[7] In Peshawar, research of such nature, giving emphasis on MRSA incidence is lacklustre primarily because of a lower incidence rate grounding reason for this issue to be sidelined. However, it is imperative to asses the current situation so as to evaluate the changing trend, which, can help raise awareness for the employment of control programs thus preventing any potential future expansion of the infection rate.

We were unable to identify any study depicting MRSA incidence in Peshawar as well as recognition of high risk groups in the region. The objectives of this study were to establish the pattern of MRSA incidence in Peshawar in recent years, and to identify high risk groups for acquiring infection amongst the city population.

METHODS

The study was retrospective in nature, analysing, all MRSA cases reported at a private laboratory in

Peshawar, receiving, patients from across the stretch of the city including the main tertiary referral centres.

All individuals who possessed positively tested specimens for MRSA were included in the study. For each patient, records were looked at for age, sex, specimen tested positive, hospital/community acquired and if hospital acquired then particular hospital within the city where infection was contracted. Also patient records were addressed for any immune system abnormalities, any operation conducted, presence or absence of diabetes and any history of intravenous drug use.

RESULTS

There were a total of 929 MRSA cases in our study of which 538 were males and 391 were females recorded over the time period elapsing from 2009–2011. The frequency of MRSA was 207 for 2009, 284 for 2010, and 438 for 2011. The overall age range was from 0.5 to 100 years. The mean age of patients was 34.4±20.2 years. The age range for the male population was from 0.5 to 100 years with a mean of 34.9±20.4 years. For the female group of cases, age ranged from 0.8 to 95 years with a mean of 32.3±19.8 years.

Out of the total specimens tested positive for MRSA, 650 were pus, 183 were urine, 18 were HVS, 13 were blood, 12 were tissue, 10 were fluid, 9 were ear swabs, 5 were throat swabs, 4 were sputum, and 25 samples comprised of other tissue specimens (Table-1).

Table-1: Number of specimens collected

Specimen	Number
pus	650
urine	183
HVS	18
blood	13
tissue	12
Ear swabs	10
Throat swabs	5
fluid	10
sputum	4
Other tissue specimens	25

Of the 929 cases, 371 were hospital acquired, while 558 were community acquired. For the hospital reported incidences, the Burn Care Centre had the most positives with 118 cases, followed by KTH with 102, LRH with 74 and HMC with 26 cases. The remaining 51 cases came from various government and private hospitals within Peshawar. For these hospital contracted cases of MRSA, 178 of the 371 underwent plastic procedures, 85 patients underwent hospitalisation without surgical intervention, 63 patients had some form of general surgical procedure, 20 had an orthopaedic procedure whilst 25 underwent cardiac surgery.

For the community acquired infections, 25 of the 558 patients had a compromised immune system. Of these 25, 15 were females and 10 were males. Eight of the 15 females had cancer and 7 had lupus erythematosis. Of the 10 males, 3 had HIV, 2 were asthmatics and 5 had cancer. Sixty cases of community acquired infections had a record of intravenous drug use whilst 212 had a history of diabetes in their records.

The annual MRSA incidence commencing from 2009 we have seen a yearly elevation in the frequency of cases. In 2009 there were 207 cases detected, in 2010, there was 284 cases detected, this was an increase of 37.2%. In 2011 there were 438 cases reported, this shows an increase of 54.2% from 2009. These changes are displayed in Figure-1.

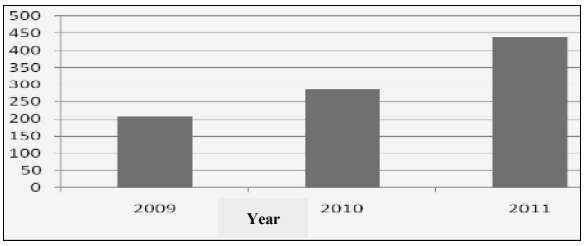

Figure-1: Year-wise number of MRSA cases

The majority of positively tested cases were hospital acquired constituting 60.1% of the total detected with the remainder acquired within the community. In respect to the hospital contracted cases, the burn care centre recorded with the highest incidence of MRSA representing 32% followed by KTH with 27.4%. LRH comprised of the third highest reported cases with 20% and HMC had the lowest number of cases constituting only 7%.

Of the total number of hospital acquired cases; 178 of 371 (48%) underwent plastic procedures, 85 of 371 (23%) underwent hospitalisation without undergoing any procedure, 63 of 371 (17%) were subjected to a general surgical procedure, 20 of 371 (5%) had an orthopaedic procedure and 25 of 371 (7%) had a cardiac procedure. Of the 558 community contracted cases, 212 (38%) displayed a history of diabetes, 25 (4.5%) had a comprised immune system and 60 (11%) reported with IV drug use.

DISCUSSION

The study depicts a consistent rise in MRSA, with the demonstration of elevated incidences recorded yearly spanning from 2009 to 2011. The reservoir for infection within the city has thus increased with a significant rise of 54% over a two year time period and the problem can further escalate with respect to the recent trends deduced. It is therefore imperative for health centres across the city to employ effective primary control measures before the issue develops and generates into a wider problem not only across Peshawar but on a national scale. In the UK, Griffiths from the Office for National Statistics published an article exemplifying an increase in laboratory MRSA reports from 210 in 1993 to 5,309 in 2002. This was

correlated with MRSA increased deaths from 51 in 1993 to 800 in 2002.[8] This trend shows that incidence and mortality increased over a 10 year period.Similarly we can draw a comparison to the findings obtained by this study as it shows a rise in the yearly occurrence. Based on this initial pattern of rise we can expect for a potential future increase and this finding should strive health centres to upregulate their preventative and control measures to limit transmission and minimise the disease reservoir.

Majority (60.1%) of MRSA cases were contracted in hospitals indicating that the focus of our preventative measure should be directed towards them. The burn care centre reported the highest incidence of hospital contracted cases. This is because burn injuries involve extensive open wounds and thus a good opportunity for bacterial transmission. This was paralleled with the fact that plastic procedures accounted for the highest incidence of MRSA cases with 32% of all the hospital acquired cases. Plastic procedures are the mainstay of therapy for burns. Apart from the burn centre, KTH and LRH had the second and third highest cases of MRSA respectively. Thus these three centres in particular should be the prime candidates for implementation of control measures.

With respect to the community acquired cases 38% displayed a history of diabetes, 4.5% had a comprised immune system and 11% reported with IV drug use. These were the major risk groups for MRSA in addition to those undergoing hospitalisation. Also the major age group at risk of contraction was 20–29 year olds with a male predominance.

CONCLUSION

The study exposes a potentially alarming increase in MRSA incidence within the city in recent years, threatening, to rise further judging the current trend. Health centres across the city should therefore implement primary control measures to reduce transmission since treatment for MRSA is financially expensive for a population; the majority of which is already socio-economically deprived.

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