SHORT COMMUNICATION

Prevalence of Panton Valentine Leucocidin gene containing *Staphylococcus aureus* in pus samples from Paediatric patients

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Abstract

Staphylococcus (Staph) aureus containing Panton Valentine Leucocidin (PVL) gene are spreading in the whole world. This gene encodes PVL toxin that has lytic effect on WBCs contributing to the low immunity of the body. It also causes pus formation in various places of the body. This study was conducted to understand the effect of PVL positive *Staph aureus* in causing purulent infections in children between the age of one day to 15 years.

Pus samples from various sites of the body from children between the age of one day to 15 years were taken. The number of pus samples containing *Staph aureus* was 45. These were collected over a period of one year, from October 2, 2017 to September 30, 2018, at the Shaikh Zayed Hospital, Lahore.

A total of 27 (60%) PVL samples were positive *Staph aureus*. Prevalence of PVL gene was noted to be high in MSSA 9(64%), wound swabs 18(75%), in isolates from orthopaedic department 6(75%), indoor 21(63%), and in males 18(66%).

Our study showed that most of the *Staph aureus* samples that were obtained from pus samples from children had PVL gene in their genome. This percentage is very high. To control its spread, we need to treat not only the patients but also their close contacts.

The main objective to conduct this study was to assess the prevalence of PVL positive *Staph aureus* strain in our local setup. Paediatric age group was selected because it is the most vulnerable group and pus samples were chosen because this strain causes recurrent purulent infections.

Keywords: PVL: Penton Valentine Leucocidin, MRSA: Methicillin Resistant *Staphylococcus aureus*, MSSA (Methicillin Sensitive *Staphylococcus aureus*), DNA (Deoxyribose nucleic acid), MDR (Multidrug resistance).

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Introduction

Staphylococcus aureus is one of the most common isolated pathogen that causes a number of diseases in almost every system of the human body.[1] One of the most common ailments it causes in human beings is purulent infections in soft tissue and skin.[2] One of the contributing factors of recurrent pus infections in *Staphylococcus aureus* is the presence of Panton Valentine Leucocidin gene (PVL).[3] This gene affects white blood cells (WBCs) in the body, thus contributing to its low immunity. PVL gene encodes for PVL toxin that has multiple effects on the body.[4] This toxin not only makes *Staphylococcus aureus* more pathogenic but also more contagious. PVL positive skin infections can spread within the family, e.g. from mother to child or other close contacts. Its outbreak can occur in groups and societies such as schools, day-care centres, sports clubs, gym, etc.[5] So it is very important to identify such strains and treat them because the treatment of PVL +ve *Staph aureus* is different from PVL-ve *Staph aureus* which involve not only antibiotics but also decolonisation of patients and close contacts. Interruption of transmission is also necessary. This is the reason this study was conducted on a group that is very vulnerable to this strain. This is probably the only study done in Pakistan regarding PVL gene frequency and its effect on antimicrobial sensitivity pattern of *Staph aureus* that came from pus samples from the paediatric age group patients.

Methods

The number of pus samples containing *Staph aureus* included in this study was 45. These were taken from the samples received from patients between the age of one day to 15 years. Complete data regarding the patient and sample was noted. These samples were subjected to laboratory protocols regarding identification, culture, biochemical test, antimicrobial sensitivity testing, and PCR, after which the results were noted.

Genetic analysis: Genetic analysis was carried out for the identification of PVL gene. This includes DNA extraction, PCR, Gel Electrophoresis, and Gene sequencing.

Results

Samples were analysed through various aspects and

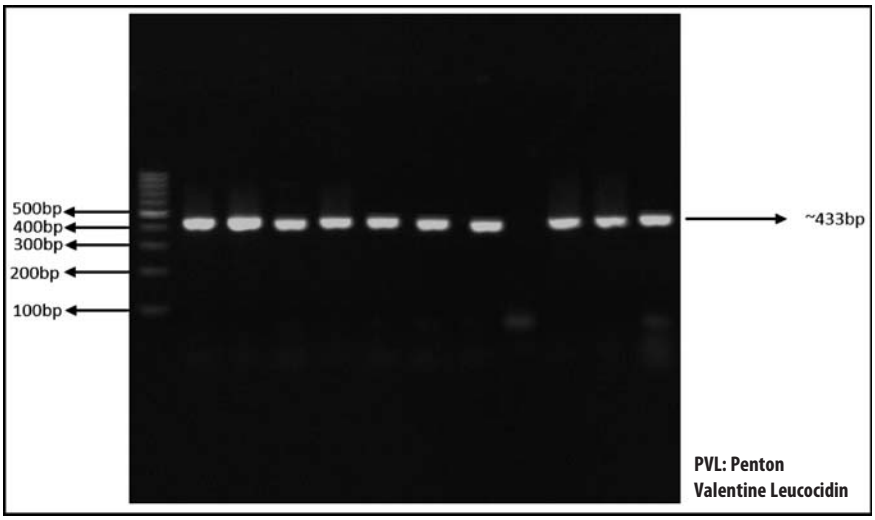

Figure: PVL gene on gel electrophoresis.

Table-1: Overall Frequency of Panton Valentine Leucocidin gene in *Staph aureus*.

Total	45 (100%)
PVL +VE	27 (60%)
PVL -VE	18 (40%)

results were compiled statistically through Statistical Package of Social Sciences. It was concluded that the prevalence of PVL gene was high in males 18(66%), in indoor setup 21(64%), in wound swabs 18(75%) and in isolates from orthopaedic department 6(75%). Among the 45 *Staph aureus*, 35(78%) were multi drug resistant (MDR). MDR isolates included those that were resistant to three or more different groups of drugs. 21 (60%) of the MDR *Staph aureus* carried PVL gene. Among the 45 *Staph aureus*, 31(69%) were MRSA and18(29%) of these MRSA were PVL +ve.

Discussion

Our research is unique in terms of participants and the number of aspects it covers regarding paediatric age group patients, i.e. relationship and prevalence of gene in indoor and outdoor setup, department wise, gender wise, and in type of sample. Antimicrobial sensitivity and resistant pattern in both PVL positive and PVL negative *Staph aureus* samples were also noted. It is the only research in Pakistan that explains all these aspects. Our results are also in accordance with other research work done in other parts of the world. For example, the study concluded that PVL gene was more prevalent in male children than female. This result is similar to that of two separate studies conducted on adult males and females in Iran and England in 2009, which showed high frequency of PVL gene in male patients (58% and 59% respectively) than female patients (42% and 40% respectively).[6,7] Our research data showed high prevalence of *Staph aureus*, PVL gene and MRSA in indoor setup while PVL gene frequency was high in MSSA. Another research indicates that PVL gene frequency was high in MRSA than MSSA.[7] This may be due to geographical difference of epidemiology. In India, a research project indicates high PVL gene frequency in children less than 14 years of age as compared to other age groups.[8]

Other research work on PVL gene showed that PVL gene frequency has been high in pus samples, specially wound swabs, than urine, blood or sputum samples.[9] The results are similar to our results, where 75% of PVL gene were in *Staph aureus* from wound swabs. Moreover, the current study also concluded that if a *Staph aureus* belongs to ear swab and the sample is from paediatric age group patient then there is more chance of this *Staph aureus* being PVL -ve than PVL +ve. This result has been proven statistically (p value=0.01). Our investigation showed that the distribution of both *Staph aureus* and PVL gene was high in *Staph aureus* isolated from samples received from orthopaedic surgery department. A similar distribution of PVL gene among various hospital departments has been reported from Nepal and India.[10,11] In our sensitivity testing, we ended that PVL frequency was the same in both MDR and non-MDR isolates but 78% *Staph aureus* were MDR while in a study conducted in India, this frequency was 91% in *Staph aureus*.[11]

Conclusion and Recommendations

The study concluded that there is high prevalence of PVL positive *Staph aureus* isolated in pus samples taken from children. This study recommends that early identification of such strains and decolonisation of not only carriers but also close contacts and interruption of person to person transmission can prevent and control its spread in our setup.

Approval and Consent to Participate: Ethical approval to conduct the study was obtained from the Institutional Review Board (IRB), Federal Postgraduate Medical Institute Shaikh Zayed Hospital Lahore.

Study Period: 2.10.2017-30.9.2018 (1 Year)

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Conflict of Interest: None to declare.

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