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ORIGINAL ARTICLE

Evaluation of Cases with Gemella Infection: Cross-Sectional Study

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Abstract

Background: *Gemella* is a Gram-positive, catalase-negative, facultatively anaerobic coccus bacterium. It is a member of the normal flora and rarely causes infection. This study aims at evaluating, accompanied by the literature, Gemella-associated infections that are also present in the normal flora.

Methods: This study is a cross-sectional study. *Gemella* infections recorded in 2014-2018 in University Hospital, Turkey.

Results: When the identified species of *Gemella* are examined, it is found that 74.4% (n = 29) is *G. haemolysans* and 17.9% (n = 7) is *G. morbillorum*. On the other hand, typology cannot be determined for the 7.7% (n = 3) of cases.

When the distribution of cases to units are examined, anaesthesia intensive care ranked first with 41.0% (n = 16). It is followed by Neurology ICU by 10.3% (n = 4), Paediatric ICU 7.7% (n = 3) and Chest diseases service 7.7% (n = 3).

Conclusion: In conclusion, *Gemella* is a member of normal flora and it rarely causes serious infections. However, the agent is susceptible to many antibiotic groups and an optimum treatment will give successful results.

Keywords

Gemella haemolysans, Gemella morbillorum, Infection

Introduction

Gemella is a Gram-positive, catalase-negative, facultatively anaerobic coccus bacterium. It is particularly located in human mucous membranes, such as oral cavity, upper respiratory tract and gastrointestinal tract. It may cause local infection or widespread infection. *Gemella* may be a causative agent in different infections, such as infective endocarditis, spondylodiscitis, brain abscess, endophthalmitis, pharyngeal abscess and empyema. It has species such as *Gemella haemolysans, G. morbillorum, G. bergeri, G. sanguinis, G. asaccharolytica, G. taiwanensis, G. parahaemolysans, G. palaticanis* and *G. cuniculi*. Among these, the most common type of species is *G. haemolysans* [1-3].

This study aims at evaluating, accompanied by the literature, *Gemella*-associated infections that are also present in the normal flora.

Methods

This study is a cross-sectional study. *Gemella* infections recorded in 2014-2018 in Kahramanmaraş Sütçü İmam University Hospital are evaluated by reviewing hospital data system and the patient files. Patient's age, gender, clinical to which he/she is admitted, type of culture specimen [tracheal aspirate culture (TAC), blood, cerebrospinal fluid (CSF), site of wound, pleural effusion, urine, sputum, gastric fluidity], antibiogram results, comorbidities, whether any surgical intervention has been made, the mean duration of hospitalization (days) and the final condition of the patient (discharge/exitus) are recorded. The approval of Ethics Committee has been obtained for this study.

The data obtained from the study are statistically evaluated with SPSS v.17.0 software program (SPSS Inc, Chicago, Illinois, USA). Continuous data are expressed as mean and standard deviations and categorical data are expressed as number and percentage. For intra-group comparisons, Student's T-test is used for the evaluation of two independent non-categorical groups. The statistical significance level is set at $p < 0.05$.

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Results

33.3% (n = 13) of cases included in the study are women and 66.7% (n = 26) are male. The mean age of the cases is 56.0 ± 30.3 years (minimum-maximum: 2-103 years).

When the identified species of *Gemella* are examined, it is found that 74.4% (n = 29) are *G. haemolysans* and 17.9% (n = 7) are *G. morbillorum*. On the other hand, typology cannot be determined for the 7.7% (n = 3) of cases.

When the obtained specimens are examined, TAC (35.9%) ranks first and is followed by blood cultures (30.8%). Other specimens are wounds (10.3%), sputum (7.7%), urine (5.1%), pleural effusion (5.1%), CSF (2.6%) and gastric aspiration fluid (2.6%).

When the case distribution by units are examined, anaesthesia intensive care ranks first with 41.0% (n = 16). It is followed by Neurology ICU by 10.3% (n = 4), Paediatric ICU 7.7% (n = 3) and Chest diseases service 7.7% (n = 3). The case distribution and final condition by clinics are shown in Table 1.

When risk factors of the cases are evaluated, heart failure is determined in 23% (n = 9), malignancy in 20.5% (n = 8), cerebrovascular accident in 15.3% (n = 6), chronic obstructive pulmonary disease in 7.8% (n = 3), diabetes mellitus 10.3% (n = 4), hydrocephalus in 2.6% (n = 1) and cerebral palsy in 2.6% (n = 1). Surgical intervention is made to 59% (n = 23) of the cases. Some patients have more than one comorbidity. However, any underlying disease is not detected in 30.8% (n = 12) of the cases.

The mean duration of hospitalization is 35.1 ± 38.8 days (minimum-maximum: 3-181 days). When the species of bacteria are considered, the mean duration of hospitalization is 40.8 ± 43.2 days for cases with

Table 1: The distribution and final condition of cases by clinics.

	%	n	Discharge n (%)	Exitus n (%)
Anesthesia ICU	41.0	16	6 (27.4)	10 (58.7)
Neurology ICU	10.3	4	2 (9.1)	2 (11.8)
Pulmonary Service	7.7	3	3 (13.7)	0 (0)
Paediatric ICU	7.7	3	3 (13.7)	0 (0)
Paediatric Service	5.1	2	2 (9.1)	0 (0)
Neurosurgery ICU	5.1	2	1 (4.5)	1 (5.9)
Pulmonary ICU	5.1	2	0 (0)	2 (11.8)
General Surgery Service	2.6	1	1 (4.5)	0 (0)
Neurosurgery Service	2.6	1	1 (4.5)	0 (0)
Urology Service	2.6	1	0 (0)	1 (5.9)
Infectious Disease Service	2.6	1	1 (4.5)	0 (0)
Internal medicine ICU	2.6	1	0 (0)	1 (5.9)
Neurology Service	2.6	1	1 (4.5)	0 (0)
Gastroenterology Service	2.6	1	1 (4.5)	0 (0)
Total	100	39	22 (100)	17 (100)

ICU: Intensive care unit.

Table 2: The susceptibility of *G. haemolysan* and *G. morbillorum* to antibiotics.

	***G. haemolysans* (%)**	***G. morbillorum* (%)**
Penicillin	93.8	100
Ampicillin	90.8	100
Amoxicillin/Clavulanate	66.7	66.7
Ampicillin/Sulbactam	84.6	100
Cefotaxime	100	100
Cefepime	100	100
İmipenem	93.8	100
Meropenem	100	100
Clindamycin	88.9	100
Levofloxacin	60	83.3
Fusidic acid	100	100
Vancomycin	100	83.3
Tigecycline	100	100
Linezolid	100	100
Daptomycin	80	100
Quinupristin/Dalfopristin	100	100
Rifampicin	80	100
Streptomycin	0	0
Trimethoprim sulfamethoxazole	7.7	0

G. haemolysans and 19.7 ± 13.2 days for cases with *Gemella morbillorum* (p = 0.033).

The results of antibiotic susceptibility tests of the cases, where growth is detected, are shown in Table 2.

43.6% (n = 17) of the cases are exitus whereas 56.4% (n = 22) of the cases are discharged in healthy condition. When the mortality rate is examined according to the species of bacteria, 82.4% (n = 14) of the exitus patients are associated with *G. haemolysan* and 11.8% (n = 2) are associated with *G. morbillorum* and 5.9% (n = 1) are associated with cases where typology cannot be determined.

When the antibiotic susceptibility of *G. haemolysan* and *G. morbillorum* is examined, it is discovered that they are susceptible to beta-lactam, clindamycin, glycopeptides, tigecycline, linezolid, daptomycin, quinupristin/dalfopristin, rifampicin and fusidic acid but the resistance to aminoglycoside and trimethoprim sulfamethoxazole is high. The results of antibiotic susceptibility of *G. haemolysan* and *G. morbillorum* are shown in Table 2.

Discussion

Gemella was defined in 1938 for the first time by Thjotta and Boe as *Neisseria* [4]. As a result of studies conducted with electron microscopy by Reyn, et al. the cell wall structure of this bacterium was found to be a Gram (+) structure and it was defined as *Gemella* [5].

Gemella is part of the normal flora and is rarely associated with infection. It may be present in all age groups. Although it affects both genders, it is observed at higher rates in males. The literature generally involves single-case reports. When these cases are examined, the age distribution is found to be in a wide range such as 1.4-87 years, and males are generally more frequently affected [6-10]. In our study, male gender is found to be affected at a higher rate, and infection is seen in all age groups.

Gemella-associated infections are often presented as case reports and *G. haemolysans* is found to be the most frequent causative agent. In a case presented by Hadano, et al. secondary bacterial peritonitis developed after duodenal ulcer perforation and *G. haemolysans* was found to be the causative agent [11].

In another case, *Gemella sanguinis* grew in the blood culture of the patient, who developed thrombophlebitis and sepsis in the superior mesenteric vein [7]. In a meningoencephalitis case presented by Galen, et al. the causative agent was found to be *Gemella haemolysans* [8]. However, the CSF culture of this case did not show any growth. The *Gemella haemolysans* diagnosis was made by PCR method in 16S rNA of CSF specimen. In another study, a case of spondylodiscitis and paraspinal abscess caused by *Gemella haemolysans* was presented. The patient's blood culture showed its growth [12]. In the resulting antibiogram, ciprofloxacin and amoxicillin were susceptible to clavulanate. The patient was treated based on this finding. In another case presented by Sono, et al. another patient diagnosed with spondylodiscitis where *Gemella morbillorum* is the causative agent was treated successfully with IV penicillin G [13]. In a case reported by Ural, et al. the patient, who was admitted with the complaints of fever chills and shivering, a vegetation of 14 × 10 mm was detected on the aortic noncoronary cuspis [9]. *G. morbillorum* growth was detected in two of the three sets of blood cultures taken on the first day and the patient was diagnosed with infective endocarditis. The patient was susceptible to all antibiotics. After four weeks of treatment, the patient underwent valve surgery. In another case presented by Liu, et al. *Gemella haemolysins*-associated endocarditis was diagnosed in a patient with multiple myeloma and the patient was treated with Ampicillin and Gentamicin [10]. The results of our study were consistent with the literature and *G. haemolysans* was found to be the primary and *G. morbillorum* was found to be the secondary cause. A majority of our cases were evaluated as pneumonia. In one of our cases diagnosed with hydrocephalus, the diagnosis of meningitis was considered.

Although *G. haemolysins* is generally susceptible to antimicrobial agents, including penicillin, ampicillin, clindamycin, rifampin and vancomycin, some isolates may be resistant to trimethoprim and aminoglycosides [14]. Kurimaya, et al. reported in their study that the susceptibility of *Gemella* was 77% and was higher for ampicillin, ampicillin/sulbactam, cefazolin, cefotaxime, imipenem, erythromycin, clindamycin and levofloxacin [15]. Kollins, et al. reported in another study that it had susceptibility to a majority of the betalactams in the susceptibility pattern of *Gemella* and to vancomycin and macrolide; however, it had intrinsic resistance to sulfonamide and trimethopia and low resistance to aminoglycosides [16]. The results obtained in our study were consistent with the literature. While the susceptibility to drugs such as betalactam, vancomycin, and clindamycin was found to be high, resistance to TMP-SMX and aminoglycoside was also found.

Limitations

Gemella is an agent with low morbidity and mortality. Still, 43.6% (n = 17) of the cases in our study are exitus. This is associated with comorbid diseases that exist in a substantial proportion (69.2%) of our cases.

Conclusion

In conclusion, *Gemella* is a member of normal flora and it rarely causes serious infections. However, the agent is susceptible to many antibiotic groups and an optimum treatment will give successful results.

Conflict of Interest

No conflict of interest was declared by the authors.

Financial Disclosure

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