

Prevalence of infectious complications causes to admission in the renal transplant recipients and their Time-Grouping

Mojtaba Varshochi¹, Sima Abedi Azar^{2*}

¹ Infectious Diseases and Tropical Medicine Research Center, Faculty Medicine, Tabriz University of Medical Sciences, Tabriz, Iran.

² Associate Professor of Nephrology, Kidney Research Center, Tabriz University of Medical Sciences, Tabriz, Iran. sima-abedi@yahoo.com

Abstract: Introduction: Use of immunosuppressive drugs in patients after kidney transplantation is the main causes of increasing infection rate in these patients. UTI is most common and pneumonia is the most sever infection in patients after kidney transplantation. The aim of this study was evaluation of infection in patients after kidney transplantation. **Methods:** In a cross-sectional and descriptive study causes and results of infection in patients after kidney transplantation at admitted patients in the kidney transplantation ward, infectious disease and kidney wards of Imam hospital of Tabriz that have infection after kidney transplantation selected and evaluated. **Results:** Eighty three patients with post transplantation infection were enrolled to study and 39 of patients were male and 44 of them were female. Mean age of male patients was 36.97 ± 13.67 year and mean age of female patients was 39.52 ± 9.46 year ($P=0.322$). Mean transplantation infection interval of male patients was 36.10 ± 42.35 month and mean transplantation infection interval of female patients was 46.86 ± 47.87 year ($P=0.294$). Fever in 51 of patients was the most common complaint and 54 of patients having fever Cytomegalovirus infection in 20(24%) of patients was the most common infectious complication and UTI and sepsis in 17 patients and pneumonia in 13 patients were the other common infections. 56 of patients discharged with becoming well, 10 of patients were died and 17 of patients have rejection of kidney transplantation and affiliated to hemodialysis. Type of transplant in 5 patients was relative, in 44 of patients was irrelative and in 34 of them was unclear in patients' records. **Conclusion:** Considering of primary infection or reactivation of Cytomegalovirus was common and life treating after transplantation and UTI and sepsis were in next level of prevalence, although infectious complications in transplantation patients sometimes could be without fever, but importance to follow up fever, which was the most common complaint in this study, for early diagnosis of infectious complications even non infectious complications such as rejection did not forget. [Varshochi M, Abedi Azar S. **Prevalence of infectious complications causes to admission in the renal transplant recipients and their Time-Grouping.** *Life Sci J* 2015;12(3s):33-39]. (ISSN:1097-8135). <http://www.lifesciencesite.com>. 6

Keywords: Species richness; beta-diversity; taxonomic diversity; forest

1. Introduction

Due to the daily increasing number of patients with ESRD (End Stage Renal Disease) and the chronic economic and medical problems of dialysis on the one hand, and the higher possibility of kidney donation compared to other solid organs, the technical ease of kidney transplant as compared to other organs, and the considerable speed of medical advancements in preservation of transplant organs in the past decades on the other hand kidney transplant has been turned into a common procedure in most large cities. As a result, the need for alert medical pre-care teams, especially after the transplant, and their awareness about transplant preservation solutions and management of treatment of dangerous transplant complications and patient's life becomes more remarkable (Braunwald, 2001; H.T. Khosroshahi, 2006).

Imam Reza Training and Treatment Center in Tabriz University of Medical Sciences embraces a kidney transplant center which admits patients who

have received transplants in this center or other transplant centers and who complain about different physical conditions.

As a result of administration of immunosuppressant drugs especially for patients with kidney transplant (particularly in the early months of transplantation) the pattern of infection in these patients is different than other hospitalized or operated patients. According to the available information, overall urinary tract infection (UTI) is the most common infection and pneumonia is the most threatening infection in patients with kidney transplant (Braunwald, 2001; Brenner, 2000).

Considering the importance and difficulty of the approach to fever in transplant patients, the main objective of the present study was to reduce mortality and transplant rejection and also to diagnose and treat the infectious complications in such patients. This study was generally an attempt to obtain an overall image of the complications leading to hospitalization

of kidney transplant patients in the kidney transplant center and the renal and infectious diseases section.

2. Material and Methods

In this cross-sectional descriptive study of the causes and infections resulting from kidney transplant in patients admitted in the renal and infectious diseases section of Imam Reza Hospital, patients who had developed infections following the transplant were selected and examined.

In this research, the records of patients who had been hospitalized and received treatments in the renal and infectious diseases section and the internal renal diseases unit because of the problems and infectious complications they developed following renal transplantation were studied. Research results were compared and patients were classified into the following three groups based on the onset of infection. Studies were carried out on the following three groups:

- First group: Infections developed in less than 6 months following the transplant
- Second group: Infections developed in less than 6 months to 1 year after the transplant
- Third group: Infections developed 1 year after the transplant

The required information was collected from the clinical records of patients. The criteria used for the diagnosis of the CMV infection in patients were positive CMV-IgM or a four-fold increase in CMV-IgG titer as compared to base CMV-IgG.

In this study, 83 patients who had experienced infections following transplantation were included in the research and of the 83 patients 23 were selected from 600 patients hospitalized in the transplant unit. All of the 23 patients were suffering from infections and their records contained complete information. After excluding records that were incomplete regarding the required information and final diagnosis, 60 patients were selected from 145 patients who were suspected of post-transplantation infection and were hospitalized in the renal and infectious diseases section.

Statistical Analysis:

The collected data were analyzed by SPSS-17 statistical software. The collected data were expressed as percentage and mean \pm SD. Continuous (quantitative) variables were compared by Independent samples and Paired t test. Categorical (qualitative) variables were compared by contingency tables and Chi-square test or Fisher's exact test. P-value ≤ 0.05 was considered statistically significant.

3. Results

In this study, the patients who were hospitalized and treated following kidney transplantation because of infectious problems were examined and results are provided in the following.

Of the patients under study 39 were male and 44 were female. The average age of male patients was 36.97 ± 11.76 years and the average age of females was 39.52 ± 9.46 years ($P=0.322$). The average duration of hospitalization of male patients and female patients was 13.28 ± 11.76 days and 18.72 ± 15.54 days, respectively ($P=0.079$).

Upon hospitalization, 65.1% of patients were with fever and 34.9% were without fever. The average interval between transplantation and onset of infection in male and female patients was 36.10 ± 42.35 months and $46/86 \pm 47.87$ months, respectively ($P=0.294$).

The main complaint of the patients included, fever in 51 cases, respiratory distress in 19 cases, diarrhea in 11 patients, cough in 10 cases, loss of consciousness in 7 patients, oliguria and increased Cr in 5 patients, abdominal pain in 5 patients and hemoptysis in 3 cases.

Primary diagnosis of patients including CMV infection in 21 patients, sepsis in 20 patients, UTI and pyelonephritis in 16 patients, pneumonia in 13 patients, gastroenteritis in 4 patients, catheter infection in 3 patients, SBP in 2 patients, fungal infections, hepatitis, Septic arthritis, bronchitis, and one in each of the patients.

Final diagnosis including CMV infection in 20 patients, sepsis and septic shock in 17 patients, UTI and pyelonephritis in 17 patients, pneumonia in 13 patients, gastroenteritis in 4 patients, catheter infection in 3 patients, PCP in 2 patients, renal abscess in 2 patients and other causes in 5 cases (including hepatitis, TB infection B19, septic arthritis, encephalitis), each in one of the patients.

A total of 56 patients (24 male and 32 female) were released from the hospital after recovery. 10 patients (5 male and 5 female) died of infection whereas 17 patients (10 male and 7 female) needed hemodialysis because their transplants were rejected due to infection.

In this research, 54 patients (65%) had fever upon entering the study. Sepsis, which was diagnosed in 12 patients (14.5%), and UTI and pyelonephritis, which were seen in 12 patients, were the most common causes found in febrile patients. The frequency and frequency percentage of febrile and non-febrile patients are shown in Table 1.

The types of transplants were related, non-related and unknown in 5 (6%), 44 (53%) and 34 (41%) of patients.

Table 1: Frequency of Febrile patients with different diagnosing

	Fever		Total
	Febrile	Non-febrile	
Sepsis	12(14.5%)	(6%)5	(20.5%)17
Pneumonia	(13.3%)11	(2.4%)2	(15.7%)13
UTI/ Pyelonephritis	(14.5%)12	(6%)5	(20.5%)17
CMV infection	(12%)10	(12%)1	(24%)20
PCP	(1.2%)1	(1.2%)1	(2.4%)2
Gastroenteritis	(1.2%)1	(3.6%)3	(4.8%)4
Catheter Infection	(2.4%)2	(1.2 %)1	(3.6%)3
Abscess	(2.4 %)2	-	(2.4%)2
Others	(3.6%)3	(2.4%)2	(6%)5
Total	(65%)54	(35%)29	(100%)83

Table 2: The percentage of patients with different diagnoses based on the type of transplant

	Type of transplant			Total
	Related	Non appointed	Unknown	
Sepsis	3(%3.6)	(7.2%)6	(9.6%)8	(20.5%)17
Pneumonia	-	(4.8%)4	(10.8%)9	(15.7%)13
UTI/ Pyelonephritis	(1.2%)1	(9.6%)8	(9.6%)8	(20.5%)17
CMV infection	(1.2%)1	(16.9%)14	(6%)5	(24%)20
PCP	-	(2.4%)2	-	(2.4%)2
Gastroenteritis	-	(3.6%)3	(1.2%)1	(4.8%)4
Catheter Infection	-	(3.6%)3	-	(3.6%)3
Abscess	-	(1.2%)1	(1.2%)1	(2.4%)2
Others	-	(3.6%)3	(2.4%)2	(6%)5
Total	(6%)5	(53%)44	(41%)34	(100%)83

Table 3: Mean Length of stay (days) in patients with several type of infection

	Length of stay (days)		
	Mean \pm Std Deviation	Minimum	Maximum
Sepsis	16.82 \pm 14.64	1	54
Pneumonia	14.62 \pm 8.19	5	33
UTI/ Pyelonephritis	13.06 \pm 10.61	2	40
CMV infection	19.35 \pm 19.05	2	93
PCP	31 \pm 33.94	7	55
Gastroenteritis	7.75 \pm 4.92	4	15
Catheter Infection	11 \pm 8.66	6	21
Abscess	32.5 \pm 3.54	30	35
Others	13.2 \pm 6.46	5	20
Total	16.17 \pm 14.09	1	93

The types of transplants regarding the etiology of infections in patients are shown in Table 2.

The duration of hospitalization of patients under study varied between 1 and 93 days. The average durations of hospitalization of patients based on the etiology of their infections are presented in Table 3, which reflect that there was no significant difference between the average duration of hospitalization of patients and different etiologies (P=0.322).

The interval between development of infection and transplantation in the patients under study was about 1 to 180 months. The resulting intervals obtained from examinations are shown in Table 4.

According to the results, there was no significant difference between the average intervals between transplantation and development of infection regarding the different infectious etiologies of patients under study (P=0.347). The final frequency and frequency percentage results obtained from patients on the basis of infection types are shown in Table 5. The levels of post-transplantation cyclosporine in patients under study are shown in Table 6. However, since the levels of cyclosporine were not measured in 66.26% of patients, it is not possible to exactly determine different levels of this drug for different infections.

The different isolated microbial strains obtained from patients are presented in Table 7. Since the microbial cultures for the majority of patients were negative as a result of consuming antibiotics prior to sampling it is not possible to rely on the experimental symptoms of these patients.

All of the patients under study were being treated with immunosuppressive drugs and standard diets.

The serum levels of cyclosporine in patients under study are shown in Table 6.

Six of the patients were diagnosed with UTI and *Escherichia coli* pyelonephritis, 1 patient was diagnosed with gastroenteritis. *Giardia* was found in patients with renal abscess caused by *Pseudomonas* and *Mycobacterium tuberculosis*. One patient also was diagnosed with TB in laboratory examinations.

4. Discussions

In a study that was conducted by Abou-Jaoude et al. (2003) in the George Hospital of London the post-transplantation outcomes were studied in patients with post-transplantation infections. The researchers reported that 17.5% of patients rejected the transplants with post-transplantation infections (Abou-Jaoude and Almawi, 2003).

In the present study, transplant rejection was seen in 20.5% of the patients. This result complies with the result of the aforementioned study.

The aforementioned researchers stated that of the 15 patients who were hospitalized for infection episode 75% demonstrated bacterial infection and 25% showed viral infection (CMV) (Abou-Jaoude and Almawi, 2003).

In the present study, viral infection was seen in 20 patients (24%).

The results of the present study were similar to the results of the aforementioned study with regard to the prevalence of post-transplantation viral infection.

The average duration of hospitalization of these patients was 12.7 ± 1.3 days (Abou-Jaoude and Almawi, 2003).

In the present study, the average duration of hospitalization of all patients under study was 16.16 ± 14.08 days and the deceased patients were also hospitalized for 24.40 ± 18.38 days.

The duration of hospitalization of the deceased patients was longer than other patients, but the difference was not significant.

In a study that was carried out by Hwang et al. (2004) in North Korea it was reported that in a 64-month follow-up of patients with renal transplant, viral infection was seen in 156 of the 561 patients under study.

CMV with a prevalence of 36.3% was also the most common type of viral infection in such patients (Hwang, 2004).

In the present study, 83 cases of infections after renal transplantation were studied and CMV was seen in 20 patients (24%).

This result also complies with the result of the above study and it is indicated that viral infection is common among these patients.

Alangaden et al. (2006) conducted a study in the infectious diseases section of Detroit University (USA) and reported that UTI, viral infection, pneumonia, and wound infection were seen in 47%, 17%, 8% and 7% of the patients under study and were the causes of infection in those patients (Alangaden, 2006).

In the present study, viral infection, pneumonia, and sepsis were seen in 24%, 13.2% and 14.45% of patients, respectively.

Therefore, the results of this study were similar to the results of the above mentioned study.

Charfeddine et al. (2002) carried out a study in the nephrology and renal transplant department of Sfax University of Tunisia.

They stated that there was a significant relationship between the viral infection caused by CMV and transplant rejection in patients under study (Charfeddine, 2002).

In our study, the prevalence of transplant rejection among all of the patients under study was 20.5%.

The rejection of transplants in patients with CMV who were hospitalized and treated was 30%, which indicated that the level of transplant rejection was high among the patients as compared to patients with other infections. Therefore, CMV infection can be considered one of the common causes of post-operative transplant rejection. This result is also similar to the result of the above study.

In a study by Smets et al. in Holland the development of infection after renal transplant was studied and it was concluded that the total annual prevalence of post-transplantation infection was 2.9 infections per patient. Surgery wound infection was also seen in 30% of the patients (Smets, 1997).

In the present study, 5% of patients were diagnosed with gastroenteritis.

Varon et al. (2004) conducted a study in Detroit (USA) and stated that although because of the improvements of surgical techniques and administration of anti-graft drugs the rate of survival of patients after renal transplantation has increased drastically, infection still leads to increased mortality and morbidity in such patients (Varon, 2004).

In a study that was carried out by Charfed-dine et al. (2005) in the nephrology department of Sfax

University of Tunisia a total of 48 patients with infections developed after renal transplantation were examined. Of the 48 patients, 24 were diagnosed with UTI, 11 were diagnosed with CMV, 9 had sepsis and 4 had pneumonia (Charfeddine, 2005).

In our study, 20, 13 and 17 patients were diagnosed with CMV infection, pneumonia and sepsis, respectively. Therefore, the results of this study are in line with the results of the above study.

In 2005, in a study that was conducted in the nephrology department of Vergata University in Rome (Italy) it was found out that infection in patients receiving transplantation leads to increased mortality and morbidity of these patients while immunosuppressive treatment of these patients also increases the risk of infection (Splendiani, 2005).

Table 4: The mean interval between infection and transplantation in patients with infections

	Distance from transplant (months)		
	Mean \pm Std Deviation	Minimum	Maximum
Sepsis	33.86 \pm 44.49	3	144
Pneumonia	51.58 \pm 46.70	3	144
UTI/ Pyelonephritis	52.59 \pm 51.88	4	180
CMV infection	42.30 \pm 43.98	2	156
PCP	2 \pm 0	2	2
Gastroenteritis	29.75 \pm 28.43	5	60
Catheter Infection	22 \pm 15.1	6	36
Abscess	18.5 \pm 24.75	1	36
Others	57 \pm 70.78	3	156
Total	41.89 \pm 45.45	1	180

Table 5: Frequency of patients with several types of infections

	Outcome			Total
	Recovery	death	rejection and the need for dialysis	
Sepsis	8(9.6%)	(7.2%)6	(3.6%)3	(20.5%)17
Pneumonia	(9.6%)8	(1.2%)1	(4.8%)4	(15.7%)13
UTI/ Pyelonephritis	(18.1%)15	-	(2.4%)2	(20.5%)17
CMV infection	(18.1%)15	-	(6%)5	(24%)20
PCP	(1.2%)1	(1.2%)1	-	(2.4%)2
Gastroenteritis	(4.8%)4	-	-	(4.8%)4
Catheter Infection	(2.4%)2	-	(1.2%)1	(3.6%)3
Abscess	(2.4%)2	-	-	(2.4%)2
Others	(1.2%)1	(2.4%)2	(2.4%)2	(6%)5
Total	(67.5 %)56	(12%)10	(20.5%)17	(100%)83

Table 6: Levels of cyclosporine in of patients with several types of infections

	Levels of cyclosporine			Not-checked	Total
	< 150	150-350	> 350		
Sepsis	1(1.2%)	(3.6%)3	(2.4%)2	(13.25%)11	(20.5%)17
Pneumonia	(1.2%)1	(3.6%)3	(1.2%)1	(9.6%)8	(15.6%)13
UTI/ Pyelonephritis	(4.8%)4	(2.4%)2	-	(13.25%)11	(20.5%)17
CMV infection	(2.4%)2	-	(6%)5	(15.6%)13	(24%)20
PCP	(1.2%)1	(1.2%)1	-	-	(2.4%)2
Gastroenteritis	-	(1.2%)1	-	(3.6%)3	(4.8%)4
Catheter Infection	-	-	-	(3.6%)3	(3.6%)3
Abscess	-	(1.2%)1	-	(1.2%)1	(2.4%)2
Others	-	-	-	(6%)5	(6%)5
Total	(10.8%)9	(13.25%)11	(9.6%)8	(66.26%)55	(100%)83

In the present study, the rate of transplant rejection and mortality was higher in patients with infections that were developed after renal transplantation.

Grimaldi et al. (2005) carried out a study in Italy on 121 patients after their renal transplantation and reported that 25 patients (20.7%) demonstrated infectious complications. Moreover, CMV infection was seen in 12 patients. Of the 12 patients, 9 patients developed infections in the first 3 months after the transplantation (Grimaldi, 2005).

In the present study, CMV infection was observed in 24% of the patients after renal transplantation which is similar to the finding of the above mentioned study. Moreover, the interval between the onset of infections and transplantation was 42.3 months in the present study and CMV infection had occurred after a longer time than the above study.

In the above study it was reported that awareness about the prevalence of post-transplantation infection helps the physician with timely diagnosis of infections and the required anti-microbial treatment (Grimaldi, 2005).

Takahashi et al. studied 106 patients with post-transplantation infectious complications and stated that 76% of the infections occurred in the first 4 months after the surgery. In this study, UTI and pneumonia were seen in 28.7% and 23.2% of the patients, respectively (Takahashi, 1989).

In our study, infections after renal transplantation were later than infections in the above study. That is to say, 22 infections (26.5%) developed in the first 6 months, 8 (9.6%) appeared in the second 6 months and 53 (63.9%) emerged one year after the transplantation. However, the results of the two studies were similar with regard to the type of infection.

In a study that was conducted by Abbott et al. (2002) in the nephrology department of the Walter Reed Army's medical center in Washington (USA) patients with renal transplant who had been hospitalized for post-transplant CMV were examined. The researchers stated that 79% of the patients developed CMV in the first 6 months following the transplant (Abbott, 2002).

In the present study only 20% of CMV infections occurred 6 months following the transplants. This finding reflects the better and more precise control of the infections in our study as compared to the aforementioned study.

Maraha B et al. (2001) carried out a study in Holland to study the infections developed following renal transplantation in patients. These researchers stated that UTI was the most common type of infection in such patients and recommended to bring

the Foley catheter out as soon as possible to reduce the infection (Maraha, 2001).

In a study by Alangaden et al. (2006) which was carried out in Detroit (USA) infections that occurred after renal transplant were studied. In this research, enterococcus and Escherichia coli were seen in 33% and 21% of the cases, respectively. Therefore, enterococcus and Escherichia coli were introduced as the most common organisms involved in the sickness of patients with UTI (Alangaden, 2006).

In the present study the most common organism isolated from patients with UTI and pyelonephritis was Escherichia coli. Most of the microbial cultures in our study were negative mainly because antibiotics were consumed by patients prior to the sampling. The lack of reliability of experimental results was also resulted from the incomplete records.

Conclusion

Although in this study the incomplete notes and results of etiological examinations of infections, which were included in the hospital records of participants (including the records of transplant patients), prevented accurate inferences and assessments of the prevalence of each infectious complication in patients with renal transplants, the early infection or re-activation of CMV infection is the most threatening factor while UTI and sepsis are the most common post-transplant infectious complications. However, infectious complications are sometimes seen without fever in patients with transplants. Valuing and studying the cause of fever, which was the most common complaint in the present study, are important in the premature diagnosis of infectious and non-infectious complications such as transplant rejection.

Suggestions

Due to the importance of controlling infection in patients after kidney transplant, it is recommended to take complete preventive measures to prevent infection in such patients and treat and control infections precisely and regularly.

Patients shall also be informed of the important contribution of immunosuppressant drugs, which are necessary for chemoprophylaxis of infections, during face-to-face and convincing training courses.

The importance of accurate and regular medical recording shall be repeatedly explained to the medical team. The accuracy and precision of medical records should also be controlled and reported.

Targeted and planned storage of patient diagnosis information in computers should be conducted in all hospitals, especially training hospitals.

For early diagnosis of the infectious and non-infectious complications of patients with transplants it is important to stress the existence of fever and early examination of febrile patients.

Medical teams should stress the importance of etiological diagnosis and carry out samplings before anything else to identify the infection factors. They should use empirical treatments only for severely ill patients in the early days of sickness or patients who do not respond properly to the comprehensive examinations in spite of adequate attempts made by the medical team.

Corresponding Author:

Dr. Sima Abedi Azar

Emam Reza Hospital, Kidney Research Center, Tabriz University of Medical Sciences, Tabriz, Iran.

E-mail: sima-abedi@yahoo.com

References

- Braunwald E, Anthony SF, Kasper DL, Hauser SL, Longo DL, Jameson JL (2001). Harrison's of internal medicine, Vol 2, 15 th. Ed. W.B. Saunders company, New York, 1399-1410.
- H.T. Khosroshahi, E.A. Shoja, L.G. Beiglu, and A.P. Hassan. Tuberculin Testing of Kidney Allograft Recipients and Donors Before Transplantation. Transplantation Proceedings, 38, 1982-1984 (2006).
- Brenner BM (2000). The kidney, Vol 2, 6 th. Ed. W.B. Saunders company, New York, 12534-2563.
- A, Almawi WY (2003). Single-center experience with tacrolimus-based immunosuppressive regimens in renal transplantation. Mol Immunol, 39(17-18), 1067-72.
- H, Kang MJ, Han SY, Park SB, Kim HC (2004). Viral infection following kidney transplantation: long-term follow-up in a single center. Transplant Proc, 36(7), 2118-9.
- A, Thyagarajan R, Gruber SA, Morawski K, Garnick J, El-Amm JM, et al (2006). Infectious complications after kidney transplantation: current epidemiology and associated risk factors. Clin Transplant, 20(4), 401-9.
- C, Kharrat M, Yaich S, Jarraya F, Mkwawar K, Hachicha J (2002). Infection in kidney transplant recipients in Tunisia. Saudi J Kidney Dis Transpl, 13(2), 195-8.
- S, van der Pijl JW, van Dissel JT, Ringers J, de Fijter JW, Lemkes HH (1997). Infectious disease complications of simultaneous pancreas kidney transplantation. Nephrol Dial Transplant, 12(4), 764-71.
- V, Alangaden GJ (2004). Emerging trends in infections among renal transplant recipients. Expert Rev Anti Infect Ther, 2(1), 95-109.
- C, Zaghden S, Kharrat M, Kamoun K, Jarraya F, Hachicha J (2005). Infectious complications in kidney transplant recipients: a single-center experience. Transplant Proc, 37(6), 2823-5.
- S, Cipriani S, Tisone G, Iorio B, Condo S, Vega A, Dominijanni S, Casciani CU (2005). Infectious complications in renal transplant recipients. Transplant Proc, 37(6), 2497-9.
- G, Barletta A, Rascente M, Pisani F, Iaria G, Maccarone D, et al (2005). Infectious complications in the renal transplant recipient. Transplant Proc, 37(6), 2502-3.
- T, Yagisawa T, Hiroshi T, Teraoka S, Fuchinoue S, Honda H, et al (1989). Infectious diseases in kidney transplant recipients treated with cyclosporine. Nippon Hinyokika Gakkai Zasshi, 80(2), 175-84.
- A, Hypolite IO, Viola R, Poropatich RK, Hsieh P, Cruess D, et al (2002). Hospitalizations for cytomegalovirus disease after renal transplantation in the United States. Ann Epidemiol, 12(6), 402-9.
- M, Bonten H, van Hooff H, Fiolet H, Buiting AG, Stobberingh EE (2001). Infectious complications and antibiotic use in renal transplant recipients during a 1-year follow-up. Clin Microbiol Infect, 7(11), 619-25.
- A, Thyagarajan R, Gruber SA, Morawski K, Garnick J, El-Amm JM, et al (2006). Infectious complications after kidney transplantation: current epidemiology and associated risk factors. Clin Transplant, 20(4), 401-9.

4/25/2015