The Role of Hemodialysis in Sensorineural Hearing Loss in Chronic Kidney Failure Patients

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Abstract

Chronic renal failure affects all organ systems. Senses are not exception and hearing impairment in this group of patients is very common, particularly sensorineural hearing loss (SNHL). The aim of this study is to evaluate if hemodialysis affects hearing in patients with chronic kidney failure. This is a transversal study. In this study were included 65 patients. 21 (32.3%) female patients and 44 (67.7%) male patients Study was performed in the American Hospital 2 of Tirana during years 2015-2016, 27 (41.5%) patients during 2015 and 38 (58.5%) patients during 2016. In our study there is no characteristic connection between level of hearing loss and number of months in hemodialysis. The same result is that there is no characteristic connection between medium number of months of kidney failure and level of hearing loss. There are controversial results in many studies about this correlation but without clear results. Sensorineural hearing loss is very common in hemodialysis patients. Sensorineural hearing loss in hemodialysis patients in our study is not affected by the number of hemodialysis sessions and by the number of months with kidney failure. But still there are needed more studies in large groups of patients to arrive in a definitive conclusion.

Keywords: sensorineural hearing loss, hemodialysis sessions,

Introduction

Hearing impairment is very common in end stage renal disease patients. Sensorineural hearing loss is much more common in this group of patients than conductive hearing loss.(1) Literature data report that 20–87% of these patients have sensorineural hearing loss.(2)

Hearing loss is a common finding in patients with chronic renal failure, and deafness may occur during the course of hemodialysis. About the role of hemodialysis in causing hearing loss there are controversial studies.

Methodology

The study included 65 patients in end stage renal disease treated with hemodialysis, three times a week, for 4–4.5 hours, using capillary dialyzers made of cellulose diacetate or polysulphone, of the surface area of 1.5–2.2 m^2, of predominantly low permeability, sterilized by g-irradiation or ethylene oxide, with common blood (250–300 mL/min) and dialysate flow (500 mL/min). Water for dialysis was prepared by reverse osmosis, and conductivity of below 10 $\mu S/cm^3$ was ensured. Exclusion criteria were history of exposure to noise, Alport's syndrome and those with conductive and/or mixed hearing loss confirmed by pure tone audiometry. The patients underwent examination by the otorhinolaryngologist which was familiar with the study. HT was measured for air and bone conductivity, for both ears, for frequencies of 125, 250, 500, 1000, 2000, 3000, 4000, 6000 and 8000 Hz.

We were based on World Health Organization Grades of Hearing impairment (WHO 2008) for the classification of hearing loss in hemodialysis patients.

Grade of impairment*	Corresponding audiometric ISO value**	Performance	Recommendations
0 - No impairment	25 dB or better (better ear)	No or very slight hearing problems. Able to hear whispers.	
1 - Slight impairment	26-40 dB (better ear)	Able to hear and repeat words spoken in normal voice at 1 metre.	Counselling. Hearing aids may be needed.
2 - Moderate impairment	41-60 dB (better ear)	Able to hear and repeat words spoken in raised voice at 1 metre.	Hearing aids usually recommended.
3 - Severe impairment	61-80 dB (better ear)	Able to hear some words when shouted into better ear.	Hearing aids needed. If no hearing aids available, lip-reading and signing should be taught.
4 - Profound impairment including deafness	81 dB or greater (better ear)	Unable to hear and understand even a shouted voice.	Hearing aids may help understanding words. Additional rehabilitation needed. Lip-reading and sometimes signing essential.

Table 1: World Health Organization Grades of Hearing impairment (WHO 2008)

Results and Discussion

In this study were included 65 patients. 21 (32.3%) female patients and 44 (67.7%) male patients Study was fulfilled in the American Hospital 2 of Tirana during years 2015-2016. 27 (41.5%) patients during 2015 and 38 (58.5%) patients during 2016. 81.5% of patients under hemodialysis had sensorineural hearing loss.

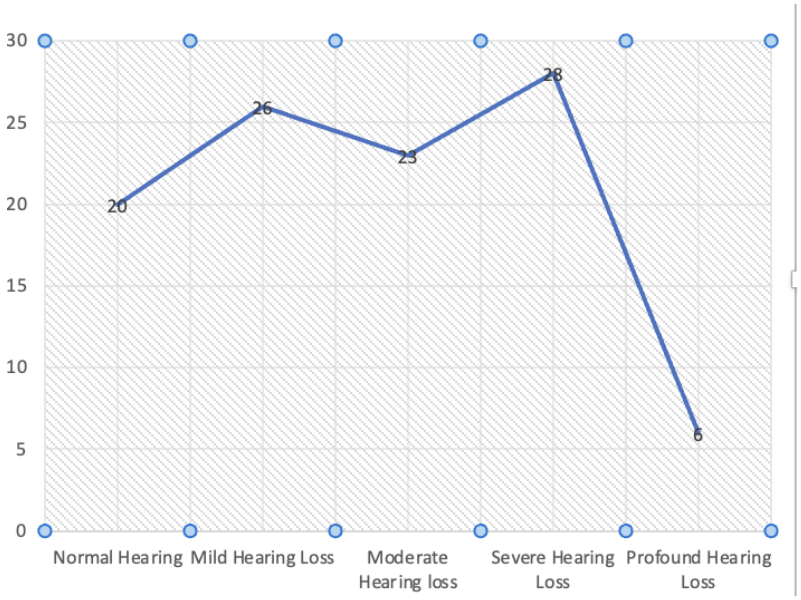

Table 1. Correlation between months in hemodialysis and levels of hearing

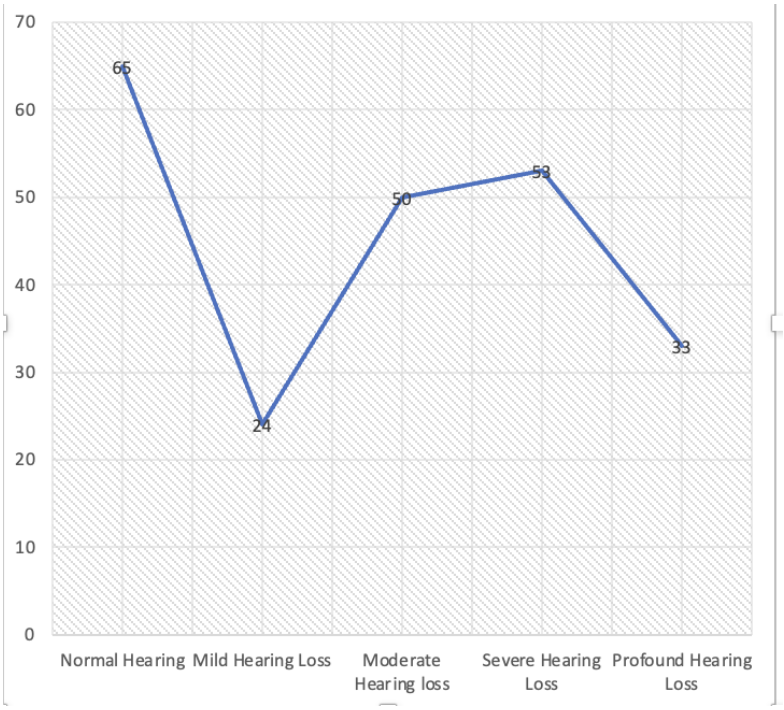

Table 2. Correlation between medium months of kidney disease and levels of hearing

In our study there is no characteristic connection between level of sensorineural hearing loss and number of months in hemodialysis. The same result is that there is no characteristic connection between median duration of kidney failure and level of hearing loss. This result is in accordance with the study of Jamaldeen et al. Based on the study of Jamaldeen and al the effects of hemodialysis in sensorineural hearing loss are still unclear. Studies about influence of hemodialysis on hearing loss are contradictory, with a number of studies that report that hemodialysis does not play a role in hearing loss connected with kidney failure. Even though in many studies was noted that duration of chronic disease has no connection with hearing loss. A recent study showed that the longer the duration of disease the worse hearing loss. Hearing loss was more evident in elderly and in patients that had less hemodialysis sessions.(3) Also Nikopoulos et al. did not arrived in a definitive conclusion about the effects of hemodialysis in sensorineural hearing loss of patients with chronic kidney failure.(4)

Based on the study of Samir et al. there are evidences of effects of hemodialysis in worsening of sensorineural hearing loss. They found clearly higher incidence of cochlear disfunction in children in hemodialysis than in children with conservative treatment with the same median duration of kidney failure as hemodialysis.(5)

Also, Ghassemi et al. mentioned that hemodialysis does not play a role in sensorineural hearing loss in patients with kidney failure. But Hemodialysis corrects electrolytic and metabolic disturbances. Hemodialysis decreases the risks for sensorineural hearing loss because it stabilizes metabolic and electrolytic disturbances caused by chronic kidney failure.(6)

Based on the study of Reedy et al. there is high prevalence of sensorineural hearing loss in hemodialysis patients but there is no correlation that hemodialysis does affect the sensorineural hearing loss in this group of patients.(7)

In the study of Lasisi et al. patients with sensorineural hearing loss had less hemodialysis sessions what suggests a connection between the increase of hemodialysis sessions and hearing loss. So, there is data that support the beneficial role of hemodialysis in sensorineural hearing loss. (8

A great number of patients have arterial hypotension and embolism during dialysis sessions and have hearing loss after vascular collapse. In some of these patients the hearing gradually returns to normal and in some partially. Arterial hypotension is present also in other situations as myocardial infarction, vasovagal situations and shock, but hearing loss is not present in these situations. In experimental studies is showed that vessels of the inner ear are not affected from autonomous nervous system. In hemodialysis with fast ultrafiltration is noticed acute mononeuritis. It is believed that rapid decrease of extracellular volume causes neural ischemia. It is known that neuritis is present in uremic patients but the cause is not known. There are not discovered yet uremic toxins or other specific pathologic anomalies in

cochlear and vestibular nerve of temporal bones of patients with chronic kidney failure undergoing hemodialysis.(9)

Conclusion

Sensorineural hearing loss is very common in hemodialysis patients. Sensorineural hearing loss in hemodialysis patients in our study is not affected by the number of hemodialysis sessions and by the number of months with kidney failure. But still there are needed more studies in large groups of patients to arrive in a definitive conclusion.

Acknowledgments

We would like to thank the patients for their collaboration.

Conflict of Interest

The authors declare that they have no conflicts of interest.

Author Contributions

Emirjona Vajushi followed these patients, drafted and revised this manuscript.

Ethics Approval

An Ethics Approval Statement was not required for this report.

Animal Rights

This article does not contain any studies with human or animal subjects performed by the any of the authors.

Data Availabilty Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

[1] Ghasemi, M. M., Bakhshaei, M., & Saheb Jamei, A. (2004). Hearing loss in hemodialysis patients. Medical Journal of the Islamic Republic of Iran, 17(4), 293-296.

[2] Jakić, M., Mihaljević, D., Zibar, L., Jakić, M., Kotromanović, Ž., & Roguljić, H. (2010). Sensorineural hearing loss in hemodialysis patients. *Collegium antropologicum*, *34*(1), 165-171.

[3] Jamaldeen, J., Basheer, A., Sarma, A. C., & Kandasamy, R. (2015). Prevalence and patterns of hearing loss among chronic kidney disease patients undergoing haemodialysis. *The Australasian medical journal*, *8*(2), 41.

[4] Krajewska Wojciechowska J., Krajewski W., Zatoński T. Otorhinolaryngological dysfunctions induced by chronic kidney disease in

pre- and post-transplant stages. *Eur Arch Otorhinolaryngol.* 2020; 277: 1575–91.

[5] Lasisi, A. O., Salako, B. L., Osowole, O., Osisanya, W. P., & Amusat, M. A. (2006). Effect of hemodialysis on the hearing function of patients with chronic renal failure. African Journal of Health Sciences, 13(3).

[6] Nikolopoulos TP, Kandiloros DC, Segas JV, Nomicos PN, Ferekidis EA, Michelis KE, Apostolopoulos NJ, Adamopoulos GK. Auditory function in young patients with chronic renal failure. Clin Otolaryngol Allied Sci. 1997 Jun;22(3):222-5.

[7] Reddy, E. K., Prakash, D. S., & Krishna, M. G. R. (2016). Proportion of hearing loss in chronic renal failure Our experience. Indian Journal of Otology, 22(1), 4.

[8] Rizvi, S. S., & Holmes, R. A. (1980). Hearing loss from hemodialysis. Archives of Otolaryngology, 106(12), 751-756.

[9] Samir, M., Riad, H., Mahgoub, M., Awad, Z., & Kamal, N. (1998). Transient otoacoustic emissions in children with chronic renal failure. *Clinical otolaryngology and allied sciences*, *23*(1), 87-90.