|| Print ISSN: 2589-7837 || Online ISSN: 2581-3935 ||

International Journal of Medical Science and Diagnosis Research (IJMSDR)

Available Online at www.ijmsdr.com

Volume 3, Issue 1; January: 2019; Page No. 141-145

SURVEY ABOUT DRUG INDUCED OTOTOXICITY AMONGST HEALTHCARE PROFESSIONALS OF CENTRAL INDIA

[1]Dr. Sachin Kuchya, [2]*Dr. Sonali Rode, [3]Dr. Kavita Sachdeva, [4]Dr. Harsh Salankar

[1] Associate Professor, Department of Pharmacology, NSCB Medical College, Jabalpur

[2*] Professor, Department of Pharmacology, Shri Shankaracharya Institute of Medical Sciences, Bhilai

[3] Associate Professor, Department of ENT, NSCB Medical College, Jabalpur

[4] Professor, Department of Pharmacology, Shri Shankaracharya Institute of Medical Sciences, Bhilai

Conflicts of Interest: Nil

ABSTRACT:

Background: Drug induced ototoxicity is an important cause of deafness worldwide and a concern for the medical community. The effect of hearing loss on the quality of life is detrimental and therefore should be prevented as far as possible through careful monitoring and management of ototoxic medication.

Method: Survey was carried out to assess the knowledge and understanding about drug induced ototoxicity. A Google form was designed, validated and sent to almost 400 medical practitioners and students of BASLP programme spread across central India. It was successfully answered by 86 recipients.

Results: 49.41% responses were from medical practitioners, comprising of ENT surgeons and subject experts while the rest 50.59% were BASLP students. New hearing impaired subjects per week were 20-30, amongst these 5-6 subjects were suspected with drug induced ototoxicity. Most common drugs responsible for ototoxicity were aminoglycosides, macrolides & salicylates as mentioned by medical practitioners, while according to BASLP students antineoplastic agents, aminoglycosides and loop diuretics were the most common ototoxic drugs. There was a difference between the steps undertaken for their redressal amongst medical practitioners and BASLP students.

Conclusion: Aminoglycosides (63.5%) and antineoplastic agents (60%) are the commonest ototoxic drugs. Results of the study revealed that most of the participants are aware and have good knowledge about ototoxicity and ototoxic drugs.

Keywords: Hearing loss, Ototoxic drugs, Aminoglycosides, Cisplatin, Ototoxicity monitoring

Introduction

Drug induced ototoxicity is the pharmacological adverse reaction affecting the inner ear or auditory nerve, characterized by cochlear or vestibular dysfunction.[1] Ototoxicity remains a clinical concern due to its reported association with atleast 130 medications.[2] Aminoglycoside antibiotics, platinum-based chemotherapeutic agents, loop diuretics, macrolide antibiotics and antimalarials are the commonly used ototoxic drugs.[3] Symptoms include tinnitus, dizziness and difficulty in understanding speech in noise. [4] Unfortunately, the incidence of ototoxicity has been largely underreported because high-frequency hearing loss does not tend to interfere with routine communication and usually goes unnoticed. If hearing impairment becomes permanent, this can significantly impact quality of life and therefore should be considered when choosing drug therapy to minimize risk. [5]

Evidence has shown early detection of toxicity through prospective ototoxicity monitoring allows for consideration of treatment modification to minimize or prevent permanent hearing loss and balance impairment. One of the main factor that affect the early diagnosis and

Corresponding author: Dr. Sonali Rode

intervention of hearing loss is inadequate knowledge by medical personnel.[6] It is critically important that physicians should have the most current information available related to different facts about hearing loss. A knowledge and attitude survey aims to understand what people know about a certain concept or problem and how they react towards it.[7]

Therefore this survey was carried out to assess the knowledge and understanding about ototoxicity and ototoxic drugs among those individuals involved in screening, detection, prevention and treatment of drug induced ototoxicity.

MATERIAL AND METHODS

In our endeavor to assess the awareness about drug induced ototoxicity, we conducted a survey. This survey was done among the medical practitioners and students of Bachelor of Audiology Speech Language Pathology (BASLP) graduate programme, during the period of September-October 2018 using a questionnaire.

A Google form was designed and validated. Then it was sent to almost 400 medical practitioners and students of BASLP programme spread across central India. It was successfully answered by 86 recipients. Questions asked were, the number of hearing impaired subjects which they see every week, number of ones who were suspected to have drug induced hearing loss, most common suspected drugs & subsequent steps taken up by them.

The data from filled Google form was collected, analyzed and expressed as percentage (n %).

RESULTS

Amongst the 86 responses, one was not included as it was incomplete. Out of the 85 responses which were assessed 42 (49.41%) were from medical practitioners, comprising of ENT surgeons and subject experts while the rest 43 (50.59%) were BASLP students, who were first to interact with the subjects with suspected drug induced ototoxicity.

On an average they came across 20-30 new hearing impaired subjects per week, amongst these 5-6 subjects were suspected with drug induced ototoxicity. There was a difference between the suspected drugs and the steps undertaken for their redressal amongst medical practitioners and BASLP students as shown in table no. 1 & 2.

Most common drugs which are considered responsible for ototoxicity by the medical practitioners and BASLP students are shown in figure 1 and 2. The most common interventions were audiological evaluation, symptomatic treatment and reinforcement of awareness (faculty) and counseling, referral & frequent hearing evaluation (BASLP students).

Table 1: Knowledge of medical practitioners about ototoxicity and ototoxic drugs

Sr. No.	Questions	Response
1	Number of participants	42 (49.41%)
2	New hearing impaired subjects per week	27 per week
3	Suspected / diagnosed to be drug induced	5 per week
4	Most common suspected drugs	Aminoglycosides, Macrolides, Salicylates
5	Most frequent steps taken	Audiological evaluation, symptomatic treatment and awareness

Table 2: Knowledge of BASLP students about ototoxicity and ototoxic drugs

Sr. No.	Questions	Response
1	Number of participants	43 (50.59%)
2	New hearing impaired subjects per week	21 per week
3	Suspected / diagnosed to be drug induced	6 per week
4	Most common suspected drugs	Antineoplastic agents, Aminoglycosides, Loop diuretics
5	Most frequent steps taken	Counselling, referral and frequent hearing evaluation

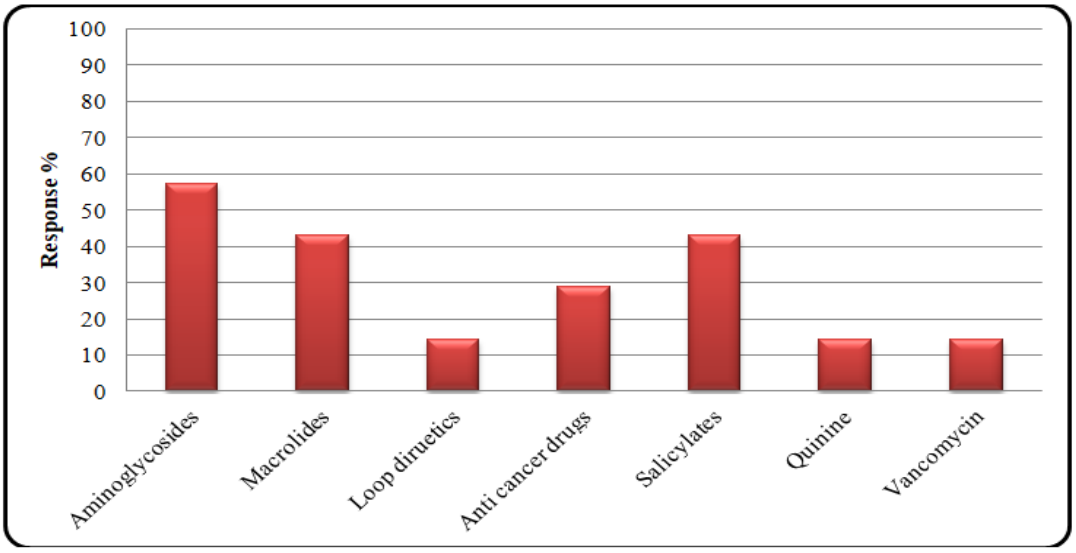

Figure 1: Suspected ototoxic drugs - Medical practitioners

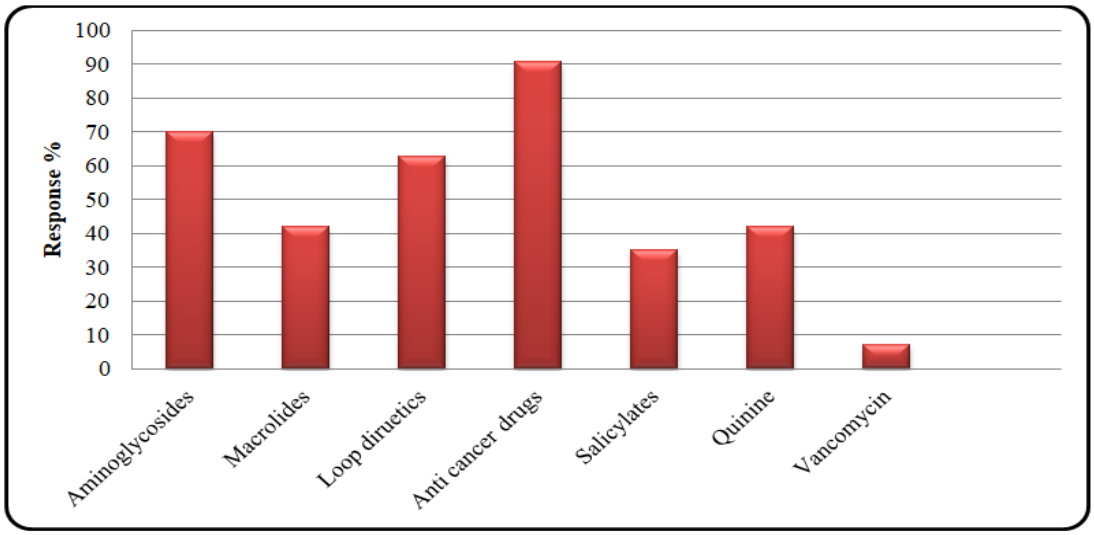

Figure 2: Suspected ototoxic drugs – BASLP students

DISCUSSION

A significant number of medications that are prescribed by doctors to treat cancers, tuberculosis and infections are ototoxic.[8] Our study determined the participants' knowledge and understanding of ototoxicity and ototoxic drugs. In comparing knowledge and practices between the levels of expertise, it was found that BASLP students were more expressive while medical practitioners were more adept at the further management and reinforcing the awareness about the drug induced ototoxicity.

Most common drugs responsible for ototoxicity were aminoglycosides (57.1%), macrolides (42.7%) & salicylates (42.6%), as mentioned by medical practitioners, while according to BASLP students antineoplastic agents (90.7%), aminoglycosides (69.8%) and loop diuretics (62.8%) were the most common ototoxic drugs. The study reinforced the earlier findings that the most of the drug induced hearing loss is seen in subjects being treated for tuberculosis, cancer and renal failure. Hence the knowledge of our respondents is in line with previous findings.[9] Aminoglycosides (63.5%) and antineoplastic agents (60%) are the commonest ototoxic drugs in our survey. Antibiotics and antineoplastic agents are perhaps the most commonly used medications that can cause hearing loss [10] similar to our study. Although sources differ, it is

estimated that aminoglycosides affect approximately 33% of patients [11] and chemotherapy drugs (e.g. cisplatin or carboplatin) affect 22% - 70% of the patients. [12]

Aminoglycosides are the antibiotics that are highly effective in treating life threatening gram negative bacterial infections, such as meningitis and bacterial sepsis in infants. [13,14] Individuals that receive sufficiently high doses of aminoglycosides experience both functional and/or morphological damage in the cochlea.[15] It should be noted that the clinical impact of ototoxicity due to aminoglycosides is minimal in current practice with appropriate monitoring. This is not the case however with the use of certain macrolide antibiotics such as azithromycin. While a periodic use dose not impose a significant threat, chronic administration can cause permanent hearing loss. [16]

Cisplatin is a mainstay of treatment in variety of solid tumors, notably testicular cancer. The major toxic side effects include nephrotoxicity, peripheral neurotoxicity and ototoxicity. [17] Risk of cisplatin ototoxicity appears to increase at extremes of ages, with elderly patients and pediatric population being particularly at risk. [18] Although both cause ototoxicity due to oxidative stress, the mode of cell death differs. Cisplatin primarily triggers an apoptotic cell death pathway, whereas aminoglycosides triggers both necrotic and apoptotic cell death pathways. [19,20]

Beyond recognition of commonly used medications that can cause ototoxicity, clinicians can consider several factors while designing a medication regimen including, but not limited to concomitant use of ototoxic agents, dose and frequency of administration and renal function. Not surprisingly, co-administration of ototoxic agents, utilization of high doses or frequent administration may warrant close assessment through monitoring of laboratory values or clinical status of the patient. This is especially important in the case of renal decomposition, as this may increase the risk for ototoxicity.

Audiological evaluation, symptomatic treatment & reinforcement of awareness were most common interventions done by the medical practitioners. Counseling, referral and frequent hearing evaluation were the common interventions by the BASLP students which are similar to the western scenario where 43.7% indicated referral to an audiologist.[6]

Ototoxic hearing loss often progresses unnoticed until a communication problem becomes apparent, signifying that hearing loss within the speech frequency range has occurred. Therefore, early detection of ototoxicity must involve direct auditory function assessment. Role of high frequency audiometry in early detection of development of ototoxicity is noticeable. [5] Patients undergoing long term therapy with ototoxic agents must undergo audiological surveillance during treatment. Any significant change in the auditory thresholds should be evaluated by the ENT specialist before further continuation of treatment. If hearing changes are identified, physicians may alter dosages or discontinue treatment with current medications, switch to less toxic drugs, or continue treatment and prepare the patient and family to cope with the hearing loss. If no hearing changes are noted, physicians may aggressively treat the disease with increased confidence. Early detection and monitoring of ototoxic hearing loss provides opportunities for counseling regarding communication strategies and implementation of aural rehabilitation.

Ototoxicity is a detrimental adverse effect, but its impact can be minimized by following precautionary standards. Assessment of any past medical history including hearing loss, dizziness or tinnitus, baseline hearing and review of the medication regimen for ototoxic agents help reduce overall incidence. Additionally, utilization of ototoxic agents at the lowest effective dose for the duration necessary should be emphasized. Reporting these cases to pharmacovigilance programme of India will help us build better clinical prediction guides and modify our own treatment strategies. Further research is necessary to prevent and augment the ototoxicity.

CONCLUSION

Treatment with ototoxic medications can cause hearing loss with potential, social, emotional and vocational consequences. Ototoxicity monitoring provides opportunities to consider alternative

treatment regimens to minimize or prevent hearing loss progression. Audiological management of such patients can be an integral part of a therapeutic treatment plan, improving quality of life during and after treatment. Further research is required to find out methods to prevent ototoxicity.

REFERENCES

1. World Health Organization. Report of an informal consultation on strategies for prevention of hearing impairments from ototoxic drugs. 1994 WHO/PDH/95.2.
2. Seligmann H, Podoshin L, Ben David J, Fradis Goldser M. Drug-induced tinnitus and other hearing disorders. Drug Saf 1996;14:198-212.
3. Arslan E, Orzan E, Santarelli R. Global problem of drug induced hearing loss. Ann N Y Acad Sci 1999;884:1-14.
4. Cianfrone G, Pentangelo D, Cianfrone F, Mazzei F, Turchetta R, Orlando MP, et al. Pharmacological drugs inducing ototoxicity, vestibular symptoms and tinnitus: a reasoned and updated guide. Eur Rev Pharmacol Sci 2011;15:601-636. Of patients
5. Konrad-Martin D, Gordon JS, Reavis KM, Wilmington DJ, Helt WJ, Fausti SA. Audiological monitoring of patients receiving ototoxic drugs. ASHA Division 6: Perspectives on hearing and hearing disorders: Research and Diagnosis 2005; 9(1): 17-22.
6. Lopez-Vazquez M, Berruecos P, Lopez LE, Cacho J. Attitude and knowledge of hearing loss among medical doctors selected to initiate a residency in Mexico. Int J Audiol 2009; 48:101-107.
7. Kaliyaperumal K. Guideline for conducting a knowledge, attitude and practice (KAP) study. Community Ophthalmol 2004; 4: 7-9.
8. Schellack N & Naude AM. An overview of pharmacotherapy-induced ototoxicity. South African Family practice 2013; 55(4): 357-365.
9. Patel RN. Deafness caused by ototoxicity in developing countries. Community ear and hearing health. 2006; 3: 18-22.
10. Bantoi A. Ototoxicity hearing loss and pharmacology. Advance Healthcare Network for Speech and Hearing 2004; 14(2): 10.
11. Cheng AG, Huth ME & Ricci AJ. Mechanisms of aminoglycoside ototoxicity and target of hair cell protection. Int J Otolaryngol 2011; 1(19): 1-19.
12. Yansey A, Harris MS, Egbelakin A, Gilbert J, Pisone DB & Renbarger J. Risk factors for cisplatin associated ototoxicity in paediatric oncology patients. Pediatric Blood Cancer 2012; 59(1): 144-148.
13. Pillers DM, Schleiss MR. Gentamicin in the clinical setting. The Volta review 2005; 105: 205-210.
14. Forge A, Li L. Apoptotic death of hair cells in mammalian vestibular sensory epithelia. Hear Res 2000; 139(12):97-115.
15. Johnsson LG, Hawkins JE Jr, Kingsley TC, Black FO, Matz GJ. Aminoglycoside-induced cochlear pathology in man. Acta Otolaryngol Suppl 1981; 383:1-19.
16. Herath SC, Poole P. Prophylactic antibiotic therapy for chronic obstructive pulmonary disease (COPD). Cochrane Database of Systematic Reviews 2013 issue 11 Art No. CD009764.
17. Rabik CA, Dolan ME. Molecular mechanisms of resistance and toxicity associated with platinating agents. Cancer Treat Rev 2007; 33(1): 9-23.
18. Steffens L, Venter K, O'Beirne G, Kelly-Campbell R. The current state of ototoxicity monitoring in New Zealand. NZMJ 2014; 127: 84-97.
19. Wu WJ, Sha SH, Schacht J. Recent advances in understanding aminoglycoside ototoxicity and its prevention. Audiol Neurol 2002; 7: 171-174.
20. Schacht J, Talaska AE, Rybak LP. Cisplatin and aminoglycoside antibiotics: hearing loss and its prevention. Anat Rec 2012;295:1837-1850.