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Awareness About Vinca Alkaloids Among Dental Students

Research Article

Dhanraj Ganapathy[1*], Kalaivani Natarajan[2], Subhashree[3]

[1] Professor and Head, Department of Prosthodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai - 77, India.
[2] Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai - 77, India.
[3] Senior Lecturer, Department of Prosthodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai - 77, India.

Abstract

Cancer is considered to be one of the major threats throughout the world. Treatment for cancer involves chemotherapy, radiation therapy and surgeries. Different groups of drugs are used for chemotherapy. One group of chemotherapeutic agents are vinca alkaloids. They are substances obtained from the Madagascar periwinkle plant. They are naturally occurring or semi synthetic nitrogenous bases extracted from the pink periwinkle plant Catharanthusroseus. They are known to have hypoglycemic activity and cytotoxic effects, hence proved to be an effective chemotherapeutic agent. A questionnaire about vinca alkaloids, its types, it's uses, and clinical scenario was administered to a group of dentists. The questionnaire had a set of questions and corresponding options, the participants had to choose one among the options. The questions were simple and easy. The results obtained were collected and tabulated. The participants were of equal ratio with 50 male and 50 female participants. Proper training and conferences should be conducted to improve their knowledge.

Introduction

Cancer is considered to be one of the most important and dangerous threat to public health. In Central south Asia, cancer of the oral cavity ranks among the three most common types of cancer with an incidence rate of 12.6 per 100000 population [1]. The treatment for oral cancer has various approaches like chemotherapy, radiation therapy and surgical approach. They are given one at a time, conjointly or on the beat. All of this can cause side effects like sore throat, dry mouth etc. In case of surgical approach, the patient requires a prosthesis of a full mouth rehabilitation. Prosthetic rehabilitation in patients who have under gone surgery are similar to the patients under going prosthetic treatment with severely resorbed ridges, yet there are certain challenges faced. There is alteration in the mandibular function and deviation of the residual fragments [1].

Chemotherapy is the use of chemicals for the treatment of cancer. One group of chemotherapeutic agents arevinca alkaloids. They are substances obtained from the Madagascar periwinkle plant. They are naturally occurring or semi synthetic nitrogenous bases extracted from the pink periwinkle plant Catharanthusroseus [2, 3]. They are known to have hypoglycemic activity and cytotoxic effects, hence proved to be an effective chemotherapeutic agent [4, 5]. The mechanisms of vinca alkaloids is through their interactions with tubu lin and disruption of microtubule function, particularly of microtubules comprising the mitotic spindle apparatus, that leads to the arrest of metaphase [6]. There are four major vinca alkaloids in clinical use: Vinblastine, vinorelbine, vincristine and vindesine but only Vinblastine, Vincristine and Vinorelbine are approved for use in the United States [7]. Vinflunine is a new synthetic drug that is currently approved in Europe for medicinal treatment [8].

***Corresponding Author**:
Dhanraj Ganapathy,
Professor and Head, Department of Prosthodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai - 77, India.
Tel: 9841504523
Email Id: dhanraj@saveetha.com

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Figure 1. represents the response of the participants about the the use of vinca alkaloids. 30% of the participants were aware it was used for the treatment of cancer (blue), 45% of the participants responded neurological disorders (green), 25% responded systemic infections (sandal).

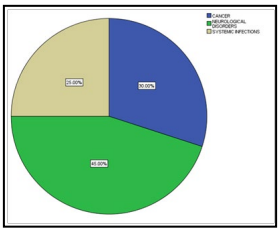


Figure 2. represents the response of the participants about the new synthetic vinca alkaloid that is currently approved for medical treatment. 24% responded vincristine (blue), 15% responded vinblastin (green), 10% responded vinorelbine (sandal), 34% responded vinflunine (violet), 17% responded vindesine (yellow).

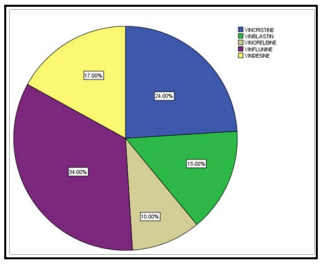


Figure 3. represents the responses of the participants for 'at which phase of mitosis does vinca alkaloids block cell division'. 22% responded prophase (blue), 30% responded metaphase (green), 25% responded anaphase (sandal), 23% responded telophase (violet).

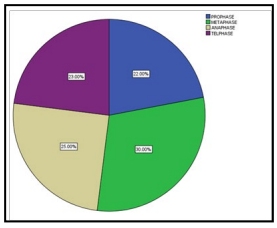
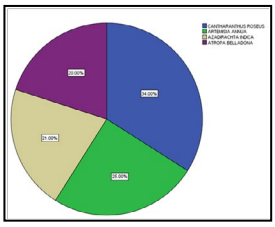


Figure 4. shows the responses of the participants from which plant vinca alkaloids are derived. 34% responded Catharanthusroseus (blue), 25% responded Artemisia annua (green), 21% responded Azadirachtaindica (sandal), 20% responded Atropa belladonna (violet).



The vinca alkaloids have been widely used in combination chemotherapy therapies. They do not have cross-resistance with drugs that alkylate the DNA and have a different mechanism of action. Vinblastine has been used as an integral part of medicinal treatment regimens for testicular carcinoma and both Hodgkin and non-Hodgkin lymphomas [9]. It is also used in breast cancer and germ cell tumors. Vinorelbine has significant antitumor activity in patients with breast cancer and can be affected on bone tumor cells, osteosarcoma. Vincristine have been used to treat acute leukemia, rhabdomyosarcoma, neuroblastoma, Wilm's tumor and Hodgkin's disease. It is also used in treating several non-malignant hematologic disorders such as refractory autoimmune thrombocytopenia, hemolytic uremic syndrome and thrombotic thrombocytopenia purpura [10]. Vinflunine is the first fluorinated microtubule inhibitor that belongs to the vinca alkaloids. This compound has been used in Europe for the treatment of second-line transitional cell carcinoma of the urotheliu [8].

Materials and Methods

Study Setting

A cross sectional questionnaire study was conducted online survey among the dental professionals. The online survey is time saving and a majority of the population can be covered. There were one hundred participants involved in this online survey.

Sampling

The simple random sampling was done as a sampling method. The number of people involved in this study includes 3 i.eguide,

reviewer and researcher. The questionnaire consisting of fifteen questions were posted for an online survey using google forms. The validity of the questionnaire was cross verified by experts.

Graphs:

The response of the participants and graphs were obtained through the online survey.

Questionnaire

1. Vinca alkaloids are used for the treatment of?
2. Which is the new synthetic vincaalkaloid that is currently approved in Europe for medicinal treatment?
3. Which phase of mitosis does vinca alkaloids block?
4. Vinca alkaloids are derived from?
5. Principle side effects of vincristine?
6. Can vinca alkaloids can also affect the non mitosis cycle?
7. Which drug is preferred for the treatment of Wilm's tumor neuroblastoma, rhabdomyosarcoma?
8. Vindesine is a synthetic derivative of?
9. Vinca alkaloids affect which cell organelle?
10. Vinpocetine is semisynthetic derivative of?

Results

The study results were as follows. The response of the participants about the the use of vinca alkaloids revealed 30% of the participants were aware it was used for the treatment of cancer 45% of the participants responded neurological disorders, 25% responded systemic infections (figure 1). The response of the participants about the new synthetic vinca alkaloid that is currently approved for medical treatment revealed 24% responded vincristine 15% responded vinblastin, 10% responded vinorelbine, 34% responded vinflunine, 17% responded vindesine (figure 2). The responses of the participants for 'at which phase of mitosis does vinca alkaloids block cell division' revealed 22% responded prophase, 30% responded metaphase, 25% responded anaphase, 23% responded telophase (figure 3). The responses of the partici-

Figure 5. Represents the response of the participants for the side effects of vincristine. 25% responded neurotoxicity (blue), 27% responded nephrotoxicity (green), 18% responded neutropenia (sandal), 30% responded anemia (violet).

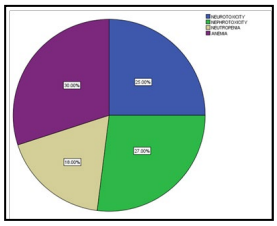


Figure 6. Represents the response of the participants 'can vinca alkaloids affect the non mitotic cell cycle'. 85% responded yes (blue) and 15% responded no (green).

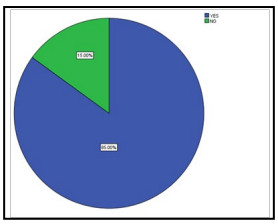


Figure 7. Represents the response of the participants 'preferred drug for the treatment of Wilm's tumor, neuroblastoma, rhabdomyosarcoma. 15% responded vincristine (blue), 25% responded vinblastin (green), 20% responded vinorelbine (sandal), 17% responded vinflunine (violet), 23% responded vindesine (yellow).

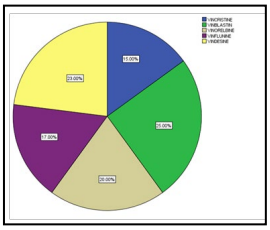


Figure 8. Represents the response of the participants 'vindeine is a synthetic derivative of'. 21% responded vincristine (blue), 31% vinblastine (green), 16% vinorelbine (sandal), 32%responded vinflunine (violet).

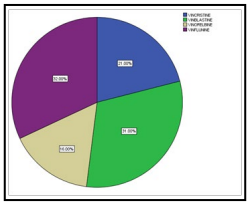


Figure 9. Represents the response of the participants ' which cell organelle does vinca alkaloids affect'. 22% responded mitochondria (blue), 34% responded DNA, 23% responded ribosome, 21% microtubule.

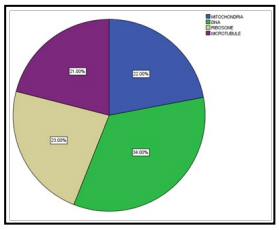
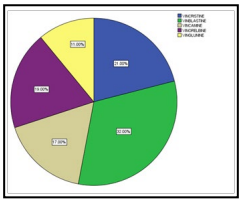


Figure 10. Represents the response of the participants for ' vinpocetine is a semisynthetic derivative of'. 21% responded vincristine (blue), 32% responded vinblastine (green), 17% responded vincamine (sandal), 19% responded vinorelbine (violet), 11% responded vinflunine (yellow).



pants from which plant vinca alkaloids are derived revealed 34% responded Catharanthusroseus, 25% responded Artemisia annua, 21% responded Azadirachtaindica, 20% responded Atropa belladonna (figure 4).

Discussion

The knowledge and awareness about vinca alkaloids among dental students were less than adequate. Only 30% of the participants were aware that vinca alkaloids are used for the treatment of Cancer. Vinca alkaloids are a class of components composed of carbon, hydrogen, nitrogen and oxygen. 34% of the participants were aware that the vinca alkaloids are obtained from Cantharanthusroseus. Many alkaloids with having poisonous characters have physiological effects too, that make them useful medicines. Vincaalakaloids are one such oldest group that is used for the treatment of cancer.

The mechanism of vinca alkaloids is through interactions with tubulin and disruption of microtublin function. Only 21% of the participants were aware about the mechanism of action of vinca alkaloids. However they are capable of many other biochemical activities that may or may not relate to their effects in microtubules. Vinca alkaloids and other antimicrotubule agents have effects on both malignant and non malignant cells in the non mitosis cell cycle, as microtubules are involved in many non mitotic functions. 80% of the participants were aware that vinca alkaloids can affect non mitotic cell cycle [11].

Although vinca alkaloids are similar from a structural position, their toxicity profiles are extensively different. All the vinca alkaloids make a characteristic peripheral neurotoxicity. But vincristine has most potential in this case. The primary pathological effects include atonal degeneration, decreasing atonal transport due to drug induced perturbation of microtubules function [12, 13]. The effects of vincristine in the central nervous system includes confusion, mental status changes, depression, hallucinations, agitation, insomnia, seizures, coma [14]. The only effective interference for vinca alkaloids neurotoxicity is discontinuing treatment or decrease of the dose or frequency of drug administration. A number of antidotes including thiamine, vitamin B12, folinic acid, pyridoxine and neuroactive agents can be used, but these treatments have not been obviously shown to be effective. The symptoms are almost similar for all the vincaalkaloids, neurotoxicity is less frequently observed in vinorelbine [15].

Synthetic derivatives of vinca alkaloids have been introduced recently. Vindesine is a synthetic derivative of vinblastine. 31% of the participants were aware about the synthetic derivative. Vinpocetine is a semisynthetic derivative vincamine.

Conclusion

Vinca alkaloids clearly form an important part of chemotherapeutics with extensive curative properties. In this study we could see that the participants' knowledge about vinca alkaloids was less. It is important that they have enough knowledge about both the basic and the recent advances in the synthesis of new drugs and also their side effects at different dosages. Conferences should be conducted to provide them adequate knowledge. Also their importance in the diagnosis and treatment of cancer should be emphasized to change their attitude.

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