Pharmacogenomics of Antihypertensive Drugs

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The appropriate drug would save lives, but it is really conceivable that perhaps the prescription that helps for others won't work in someone and will have adverse effects on other individuals. Pharmacogenomics is the new science of diverse genomic understanding and impact of drugs on the body responses. Few individual xenobiotic metabolisms disintegrate medications gradually, which can lead to serious adverse effects, while others' bodies disintegrate medications rapidly. i.e., the medication can be boon for some people whereas same medication can become curse for many people which can be life threatening. Pharmacogenomics research may detect changes for certain gene analysis of the available to the body's natural metabolic enzymes in response to specific medications, and physicians can use this data to evaluate genetic profile and forecast if a prescription will benefit or damage before drug consumption. "The correct medication, at the correct dosage level, for the particular individual". Blood associated high pressure was previously classified as >140mmhg and >90mmhg in the United States, but current guidelines have modified the value to 130-80mmhg in order to better control and prevent hypertension. Heart rate should be between 72beats/min. Blood pressure is only deemed excessively low in practise if it causes symptoms. Hypertension has no symptoms of its own, but it destroys blood vessels over time. Such fundamental pathological conditions can also be corrected by pharmacogenomics understanding. Hypertension is also known as silent killer. For treatment of hypertension antihypertensive drugs are used like-vasodilators, diuretics and drugs that decreases cardiac output.

These drugs are commonly used but, in some cases, they may become harmful for the person who is going through this medication so in this case pharmacogenomics of antihypertensive drugs are used.

There are a variety of useful medication adherence classes, including anti - hypertensive drugs, ACE inhibitors, Betablockers, and calcium channel blockers. Despite multiple effective medication classes and numerous medicines into each class, high blood pressure (BP) management rates are poor. According to estimates, only around thirty-five of hypertensive individuals have both diastolicand systolic blood pressure management (Thoenes M.*et. al.*,2009), with same counts from United States (Chobanian AV *et. al.*2003) and other countries (Mori H *et. al.*2006).

This loss of blood pressure management is not due to a lack of medication; according to one research, around thirty percent of medicated hypertensives use one hypertension medicine, forty percent take two fludrocortisone, and thirty percent take three or even more fludrocortisones (Rodriguez-Roca GC *et. al.* 2009). The findings show that the present trial-and-error methodology to bp therapy is ineffective, and that new methods for determining the best hypertensive strategy for a given individual are required. The genomic data, or functional genomics, application is to determine the best appropriate medicine for specific patient is major way for individualizing hypertension treatment.

Considering the high health costs of hypertension and the low rates of blood pressure management, hypertension pharmacodynamics has a lot of promise. Epigenetics is concerned with genes, transcriptomes, and proteins. It have ability to improve patient care by enhancing illness detection and adopting patient-specific therapies. Molecular genetic pharmacogenetics was formerly centered on clinical studies. It is presently being expanded by applying genome-wide techniques to clarify the hereditary basis of variances in medication responsiveness across people.

Classification of anti-hypertensive drugs

1. **Diuretics**
   a. Thiazides: Hydrochloro thiazides Chlorthalidone Indapamide
   b. High ceiling: Furosemide
   c. K+ sparing: Spironohctone

2. **Drugs that interfere with renin-angiotensin system**
    a. ACE Inhibitors: Captopril
    Enalapril Lisinopril
    b. Angiotensin (AT1 receptor) blockers: Lasartan, valsotran
    c. Direct renin inhibitor: Aliskinen
3. **Drugs that decrease peripheral resistance / cardiac output vasodilators**
    a. Calcium channel blockers: Amlodipine
    Nifedipine
    b. Arteriolar vasodilators: Hydralazine
    Minoxidial
    c. Arteoriolar + vexous: Sodium Nitroprusside
4. **Sympatholytics**
    a. Central sympatholytics: Clonidine
    Methyldopa
    b. Alpha adregenic blockers: Prazosin
    Terazosin
    c. Beta adregenic blockers: Alenolol
    Metoprolol
    d. Alpha beta blockers: Carredilol

Diuretics as antihypertensives

1. **Thiazide diuretics**
    Inhibit Na+ - Cl- cotransporter in distal convoluted tubule causing Natriuesis
2. **Loop diuretics**
    Inhibit Na+ -K+-2Cl- cotransporter in loop of Henle causing Natriuesis

Inhibitors of renin angiotensin system as antihypertensives

1. **ACE Inhibitors**
    Block conversion of Ag1 to Ag2, a potent vasoconstrictor
2. **AT1 receptor blockers**
    They competitively block angiotensin2, AT1 receptor
3. **Direct renin inhibitor**
    They inhibit renin and competitively blocks access of angiotensinogen to renin

Drugs that decrease peripheral resistance / cardiac output

Vasodilators

1. **Calcium channel blockers**
    They inhibit L- type Ca2+ channels of vascular smooth muscles
2. **Arteriolar vasodilators**
    They decreases peripheral resistance and generally preferred during pregnancy.
3. **Arteriolar + vexous**
    They act very rapidly i.e., within seconds and reduce peripheral resistance and cardiac output.

Sympatholytics as antihypertensives

1. **Central sympatholytics**
    They stimulate presynaptic Alpha2 receptors in brain stem and reduce sympathetic outflow
2. **Alpha adrenergic blockers**
    They are Alpha1 blockers andalso used in vasodilation. They reduce peripheral resistance.
3. **Beta adrenergic blockers**
    They blocks beta1 receptors on heart which decreases cardiac output and also inhibit beta1 receptors on kidneys.
4. **Alpha- beta blockers**
    They blocks beta1+ beta2 and Alpha1 receptors which decreases cardiac output, renin and peripheral resistance.

Throughout decades of study and tens of billions in funding, hypertensive continues to be a major public health issue. Only individual gene Mendelian hypertension disorders can be explained by disease genetics, and this has a minor influence on illness burden. However, more efficient treatment of hypertension individuals is urgently required. (Mellenet. al. 2005) discuss the present state of pharmacogenetics research of medication adherence responses. More than 100 medications are now available to address the hypertension pandemic (Mc Leodet al. 2001), and scientific proof prescribing recommendations were developed [ESH *et al.* 2003]. Among hypertensive individuals get their blood pressure reduced to acceptable standards [Mancia G *et al.* 1997), leaving the majority with insufficient blood pressure and an elevated risk complications. The fact that efficiency scores aren't greater is due, in part, to the variability of antihypertensive medication responses and a range of terrible side effects that lead to considerable patients resistance (Carreteto OA *et. al.* 2000).

Present scenario of antihypertensive drugs

In present scenario this technique is being used so that the proper medication can be provided to the people which will turn into boon for them, and treatment can be provided at the right time for betterment.

This technique is still not used very often as it is very costly and moreover entire genome sequence of homosapiens is still unknown, so it becomes difficult for doctors to examine properly.

Many drugs are available in the market of hypertension for the treatment which can be used by hypertension patients. As hypertension is a life threatening disease which has become very common now a days so before going for any medication try to have a proper diet and properly taking care of your body can help you in getting over this medication but if it is becoming problem for you then you must go for a proper medication prescribed by your doctor and if your doctor knows about your health history and your genetic makeup then it would become easier for the doctor to help you out for proper treatment and you will become heathier very soon.

Future of pharmacogenomics of antihypertensive drugs

As we know clearly that genetic makeup of humans is still not known fully so there may be some other aspects that may be the reason of hypertension in human beings. And one of the most important reason for continuous increase in hypertension patients is the changing lifestyle which is creating problem in the metabolism.

Pharmacogenomics is seen as the most important aspect in the field of medication for the welfare of public. Many different drugs are available in the market which are specially designed with the aid of pharmacogenomics so that it does not cause any harm to the person who is in the medication prescribed by doctor, and it will also help to design more of the medicines for different people who may possess different type of allergies with a particular type of medication (Akhtar N *et al.*, 2021, Jain P *et al.*, 2021).

So, in the coming time the demand for pharmacogenomics will increase more rapidly and human body can be known a little more and many different type of genes and their functions can be identified.

Hence, it can easily be said that pharmacogenomics is the future.

Conclusion

Here we conclude that hypertension is increasing rapidly with time and the main reason for this is changing lifestyle due to which hypertension can be life threatening and it has become the reason for increase in death rate. So, one must take care of their health properly as "health is wealth".

It has been observed that all types of medication does not work for all types of people as their genetic makeup is different from each other. This is the reason pharmacogenomics came into existence so that genetic makeup of the patient can be known and according to that proper medication should be given.

Different types of medication for hypertension are available like diuretics, vasodilators etc. but it is not necessary that they all will be beneficial for different patient's so after knowing the genetic makeup of the patient it will become easier for doctors to treat the patient with right medication.

Hence in the coming time demand of pharmacogenomics will increase more rapidly not just for hypertension but for all the diseases.

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