Biomarkers of Physiological Function in Elderly Patients: Review Article

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ABSTRACT

There have no tools available for measuring the standard of the healthy aging process for any population group. Here chronological age used to be associated with functions related to aging but there has no such data that reveals the process of aging. Although here many researchers are getting involved in measuring key features complexity does not provide any relevant measures about the aging rate. The process here is about evaluating recommendations and analysis of physical capabilities, immune functions, and physiological functions [1]. The relevant biomarkers have been identified among the aged population but the major factors related to the aging process with the physiological mechanism play the role of quantifying the process of aging at the population level. Here different reviews from different researchers have been analyzed. Related criteria for biomarkers have different including observation of changes with aging, studies about aging, prediction, and evidence of phenotypes that are age-related, lifespan, and mortality rates. These outcomes of biomarkers and related outcomes of aging in the population have been studied. Here the diagnosis and treatment aspects have also been discussed for curing the problems that have been identified in the study.

Keywords

Cardiovascular Diseases, Biomarkers, Aging, Immune system.

Introduction

Modern society used to have the most common goals related to the healthy aging process. Here many countries have older people more than young population like Japan. Thus, the concentration of the developed economy has shifted to the aspect of social and healthcare development. The research about the factors has exposed several factors like the risk associated with age-based frailty, disease, and disability, etc. [2]. Here the studies should be initiated as per individual levels for the essential functions that are related to rates of declining physical functions as an individual is aged with time. Public health-related surveys and health outcome measures would help in analyzing the reliability of biomarkers of healthy aging. Here many researchers have been initiated in the last 50 years for measuring markers but as the aging phenotype of aging is complex thus processes practical and conceptual difficulties in the process. Thus, till now, there has no reliable definition of biomarkers of aging. The process of aging is used to affect different organs, cells, and tissues that get determined by loss of functions. The process here is about identifying the characteristics of aging and the maintenance functions that would be used for maximizing the health functions. The aim of the report is also identifying the aspects of further research processes. The priorities would be identified that are useful for being healthy for the maximum amount of time.

Epidemiology

The chapter would be evaluated for identifying issues related to physical capabilities, and physiological functions. The aging process is used for encompassing functional, structural, and functional changes that are related to tissues, cells, and organs of the human body that gets necessary for maintaining physical capabilities in the process [3].
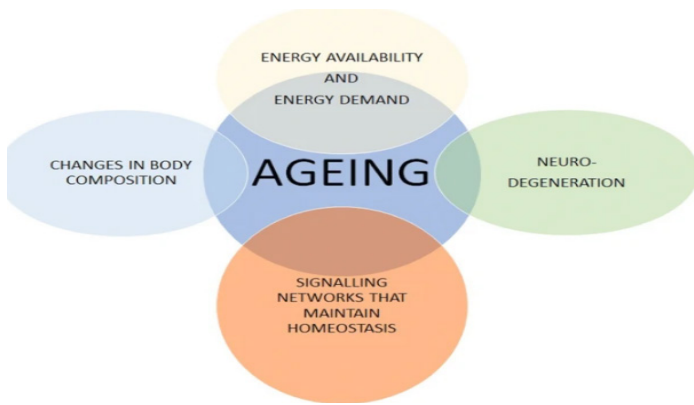
Figure: Consequences of Aging.
(Source: Xia et al., 2017)

Biomarkers related to physiological functions

The pre-determination of signs of different diseases helps in managing and controlling the disease otherwise, it could lead to chronic disease, functional loss, and could cause death finally. Here the focus of the study is about determining lung functionalities, bone health, consumptions of the body, and functions of cardiovascular aspects for the process of glucose metabolism process with the increased aging here.

Age-related outcomes

Lung Functions

At the age of 25 lung functions used to decline 32ml/year for males and females 25ml/year. This assessment has been initiated from FEV1 measures and endpoints that are related to age, cognitive functions, and mortality.

Bone Health

The mass of bone used to decline in the process also but the theory of greater decline rates in women is a topic of debate for the researchers. The measurement of bone health is on using DXA or dual x-ray absorptiometry, quantitative computed tomography, etc [4]. The process of DXA is the most widely used method for measuring bone health here.

Body Consumption and Mass

Most with the aging process body fat use to increase and mass of muscle used to decrease. Abdominal adiposity used to be another factor of risk and for 94 and 77 cm of Waist Circumference or WC used to be normal for males and females. The mortality aspect is doubled with WC of 132 and 116 cm of male and female. As per the aspects of BMI or Body Mass Index if gets increased with 5kg/m2 that is associated with a 30% increase in mortality rates, 60 to 120% of higher rental, diabetic, and hepatic mortality, and 40% of the higher vascular level of mortality.

Cardiovascular Functions

The functions of the cardiovascular system get associated with the vascular wall and cardiac muscle. There have several hemostasis-based, inflammation biomarkers of cardiovascular aging and that gets are widely used, and reliable biomarkers associated with aging. The related reviews of the meta-analysis process determine the evidence related to lipid profile, blood pressure, higher-density cholesterol, and triglycerides used to be the morbidity, and mortality predictors [5]. Higher BP rates in the middle-aged population used to be the reason for low cognitive function in the later phase of life.
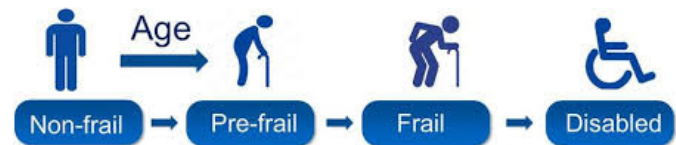

Figure: Process of Aging.
(Source: Wang et al., 2019)

Metabolism of Glucose

The aging process gets associated with the process of metabolism that gets included in receptors of insulin and transporters of glucose, and leads to a decrease in the oxidation process of glucose. The dysregulated glucose is responsible for a faster process of glucose concentration process and fastens glycated hemoglobin. The difference in 1% level in HbA1c is associated with the difference of 20% to 26% in heart disease risks and mortality gets increased. The glucose metabolism used to be considered as family longevity factor associated.

Table 2 Summary of recommended biomarkers in the physiological domain			
Subdomain	Tool/test	Feasibility of use	Prediction of outcome
Lung function	Spirometry: Forced Expiratory Volume in 1 sec(FEV1)	+++	Mortality, cardiovascular events, fractures, functional health, cognition
Bone health	Bone density, bone mass hip: Dual X ray Absorptiometry	++	Mortality, fractures, CVD
	Ultrasound: broadband ultrasound attenuation (BUA) at heel	+++	
Body composition	Estimated leg muscle mass Dual X ray Absorptiometry	++	Uncertain
	Estimated muscle mass Body impedance	+++	Mortality
	Abdominal fat Waist circumference	+++	Mortality, cardiovascular events,
	Body mass Body Mass Index Body weight	+++	Mortality, cardiovascular events,
Cardiovascular function	Systolic blood pressure Sphygmomanometry	+++	CVD, mortality
	Lipid profile: total cholesterol, LDL-C, HDL-C, Triglycerides Biochemistry assay	++	CHD
Glucose metabolism	Glycated haemoglobin Fasting plasma glucose Biochemistry assay	++	Mortality, CVD

Degree of feasibility of use: +++ strong; ++ moderate, + low

Figure: Physiological biomarkers.
(Source: Huggett, R.J., 2018)

Areas lacking Evidence

Here many emerging tools are getting used for analyzing risk factors in cardiovascular events here. These are plasma cystatin C, fibrinogen, etc. These biomarkers are not well established and require adequate research in this field [6]. Measures of physiological biomarkers used to be initiated for shorter periods but the measures should be initiated for longer periods for determining values related to it. Here proper shreds of evidence are not present that would determine age-based changes here.

Biomarkers of Physical capabilities

The physical capability used to be considered as the capability of performing physical tasks in daily life and gets useful for obtaining health associated with the present and future. Here significant tests have been evaluated for measuring physical capabilities here and get useful for the studies that are generally population-based. The objective-based studies in the process having significant advantage aspects involved like the process enables study factors of full-spectrum functionality and used for identifying people that used to perform best and also the population that faces difficulty in handling different tasks related to their life.

Domain	Tool/ measure	Feasibility of use	Prediction of outcome	Approximate costs/equipment*
Locomotor function	Gait (Walking) speed	+++	Mortality Falls +++	Stopwatch £6 (US $9.4) Measuring tape £6 (US $9.4) Marker tape £5 (US $7.8) Plastic cones £5 (US $7.8) Clipboard £3 (US $4.7)
	Timed get up and go	+++	Mortality +++	
	Chair rising	+++	Mortality +++	
Strength	Grip strength	+++	Mortality +++	Jamar Hand Dynamometer Hydraulic from £215 (US $335.8) +VAT Digital from £265 (US $413.8) +VAT
Balance	Standing balance (One leg stand, tandem stands)	+++	Mortality +++	**AIREX Balance Pad Elite £90 (US $140.6) **Accelerometer £approx £100 (US $156.2)
Dexterity	Pegboard test	+++	Evidence lacking	Rolyan®9-Hole Peg Test Kit (board+pegs+stopwatch) £72 (US $112.5) (replacement pegs £15 (US $23.4))

Table 1. Summary of recommended biomarkers in the physical capability domain

Degree of feasibility of use and prediction of outcomes: +++ strong; ++ moderate, + low

Figure: Biomarkers of physical capabilities.
(Source: Li et al., 2018)

Domain relevant to aging tools

Ascertained information of the 2008 HALCyon collaboration measures the biomarker of physical capacity here. The details of the measurement have been established using the variation of common protocols and support the measures of healthy aging [7]. The NH toolbox here includes four aspects like strength, locomotor function, dexterity, and balance that gets used for objective measures here that initiate longitudinal studies and capabilities here.

Age-based changes in physical strength

Strength of grip used to be the most relevant test of physical capability. As per the measures grip strength used to be maximum for the age group of 30 in male and female both. The studies related to grip strength also suggest that men are having higher strength in grip than women and men used to lose strength more frequently than women with increasing age.

There have several other measures that could be initiated here for measuring the physical ability of different ages. As these data are related to small studies and cross-sectional data thus the aspects of results get limited here. The conclusion about the physical capability is the strength factor is declined with increasing age and males used to have more strength than women for all age groups increase. These studies are usually based on performance measures of different age groups.

Health Outcome

The relevant studies in the process suggest that slow speed in walking, weak strength in grip, long rise time from chairs, and poor balance in standing are the signs of higher rates of mortality for the age-based populations [8]. The research associated with American studies proves that slower speed in walking is associated with higher mortality rates in the aged population. Griping strength was found to be a decline in functional areas and founds difficulty aspects in performing daily life tasks here. Another study suggests that risk could lead to disability in the process as poor performance aspects in physical capabilities in the older population could lead to disability for them. The aspects of the cardiovascular disease do not get neglected by the researchers as poorer performance could also lead to failure in this particular aspect. This study has been initiated for a smaller range of older population and does not confirm that all or a few measures would definitely occur with the symptoms of poor performances.

Areas Lacing Evidence

The protocols of the study used to be significant, as they do not provide the scope for better enhancements. Here several studies suggest that a combination of physical capability and cognitive tests would provide better performance measures here. Related capabilities of midlife provide relevant measures and provide a prediction of mortality aspects here. The consideration of every individual measure should be initiated separately. The overall aspect would provide the performance score for the process. Here further process should initiate measurement values rather than predictive values. For age-related aspects here, larger longitude studies should be initiated here.

Biomarkers of Cognitive Functions

There have several cognitive functions that get changed with the aging process the study is about analyzing longitudinal studies for the process of aging. Here age-related observations are frequent

and lack in performing processing speed, attention, but the vocabulary strength may increase with relevant age here.

Domains of Study
Here measures have been initiated with different functions and for the process here related functions are processing speed, execution speed, learning and memory, reasoning, visual memory, etc. Here the ranges related to practical outcomes have been accessed and lists have been prepared for accessing the sub-domains of the study [9].

Patterns of Changes and Health Outcomes
From the sub-domains that get associated with the study processing speed and executive function here used to be associated with the phenotypes of aging here. The speed of processing used to decline with the age from young to adulthood here. As per the aging concerns processing speed gets increased with the age and provides longevity in the process. The aspect of functional loss used to be observed commonly in the process of cognitive impairments. As per the current studies change aspects of age used to be associated with outcomes of health and gets determined using three different functions like processing speed, verbal decalcification memory, and execution functions here. The tests related to cognition are not sufficient but use the most commonly utilized cognitive functions that are associated with the aging process.

Areas of Lacking Evidence
There have several tools that have been developed for measuring these aspects such as the NIH toolbox. The efficiency of the cost related to this provides the effectiveness of cost and the analysis process used to evaluate digital aspects [10]. The process is supportive of the technical development in different tools with the development of computer hardware and software. Here the variance of tools used to be initiated by researchers. The tests related to cognitive would also be helpful for analyzing better physical conditions in the process.

Treatment
The aging of all organs in the process determines physiological changes. With the change, here blood pressure increases and cardiac output decreases here. Lungs in the body used to exchange gases at an abnormal rate and rates of expiratory flow get slower. The decline of functional variance remains relatively constant in the process of aging in the population [11]. Thus, the rate of aging for different age groups used to be similar but age-based changes used to be more for the older population. The treatment could be classified as pre-evaluated measures here. These measures could be classified in many different forms but the treatment aspect here evaluated is helpful for the overall process. These could be:

Fulfillment of caloric needs
The caloric needs could be defined as per the weight of the person and classified as overweight, underweight, and normal weight. The ingestion of calories should be reduced by 10% for the age group of 50 to 70 as per the daily activity aspects. For the 70+ age group, the intake of calories should be reduced by 15% to 20%. The energy intake should be proper and the meal should be balanced otherwise it would cause malnutrition and loss of weight for the elderly people [12]. While dealing with meal aspects catabolic metabolism should be maintained else would lead to a loss in mass of different organs and loss in mass of bone. For older people intake of optimal energy provides the aspects of well-being. The process requires a supply of vitamins, proteins, minerals, etc.

The protein metabolism process is essential for older peoples as 8 out of 20 proteins get delivered to the human body by food intake. The proportion of protein in the body affects the physiological mechanism of the body here. The proper amount of protein intake can improve the strength and mass of the muscle and bone.
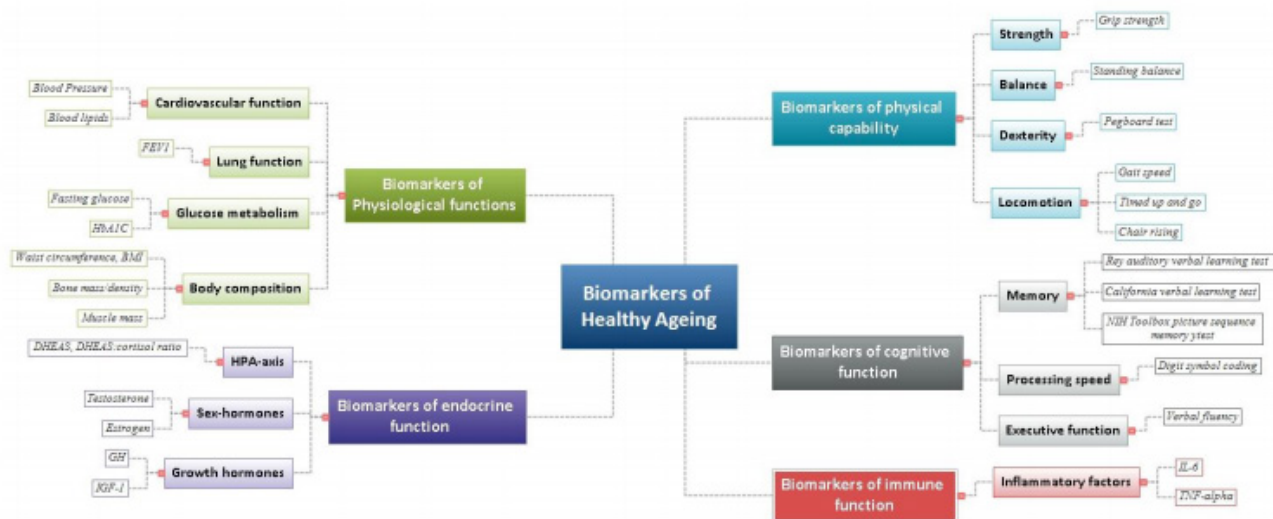
Figure: Biomarkers of healthy aging.
(Source: Dong et al., 2017)

Drug	Pharmacodynamic effect	Age-related change
Adenosine	Heart-rate response	↔
Diazepam	Sedation, postural sway	↑
Diltiazem	Acute and chronic antihypertensive effect	↑
	Acute PR interval prolongation	↓
Diphenhydramine	Postural sway	↔
Enalapril	ACE inhibition	↔
Furosemide	Peak diuretic response	↓
Heparin	Anticoagulant effect	↔
Isoproterenol	Chronotropic effect	↓
Morphine	Analgesic effect	↑
	Respiratory depression	↔
Phenylephrine	α_1-adrenergic responsiveness	↔
Propranolol	Antagonism of chronotropic effects of isoproterenol	↓
Scopolamine	Cognitive function	↓
Temazepam	Postural sway	↑
Verapamil	Acute antihypertensive effect	↑
Warfarin	Anticoagulant effect	↑

↑ = increase; ↓ = decrease; ↔ = no significant change; ACE = angiotensin-converting enzyme.

Figure: Changes with aging.
(Source: Díaz et al., 2016)

Adoption of Drug

The effects of drug absorption in the process of aging are a regular aspect. This also has significant consequences as it provides conflicting results regarding the process. The rate of absorption of iron, Vitamin B12, and calcium have been reduced while the absorption of levodopa has been increased here. The discrepancy of the results could be because of different aspects of absorption. The drugs are called polar drugs that contain smaller distribution volumes to provide a higher number of serums for the older people groups here. Ethanol, cimetidine, gentamicin, etc used to fall under this category here. For accommodating required changes dose of digoxin is to be reduced [13]. The elements of drugs that are generally lipid-soluble are called non-polar compounds here. The selection of drugs should be proper that would eliminate the aspects of negative effects. As most of the elderly people used to consume drugs as per their physical illness thus, the selection of less harmful drugs becomes important.

Prevention

The subject of the report was about to evaluate the extent to those activities of physical aspects could differ here and identifies the influences of diseases. The scope of increasing life expectancy could be physical exercise here. Different studies have been initiated for analyzing aspects of physical activity here but used for reducing factors of risk related to aging biomarkers. Regular activity in physical aspects could reduce the risks of diseases like stroke, cancer, heart disease, and diabetes, etc. regular exercise could enhance life expectancy from 0.6 months to 7 years.

The population of the world is getting older day by day and the data suggests that 12% of the global population has become aged. The rate of growth in the aging population is around 3.6% for every individual year. Thus, for the aged population health becomes an important aspect here [14]. For maintaining health here, different therapies could be used and laughing therapy could be useful for this process. The process of suggestion is improving general health aspects, improvements in biological and psychological functions in the process. The immune system of the process provides stress reduction and for older aged peoples it would be useful for developing mental health also. A 3-month study has been initiated for older peoples where they were facilitated with laughter classes and this helped increasing minerals in bone and hemoglobin. Different hobbies, joyful music, and laughter classes are used to improve aspects of endothelial functions here.
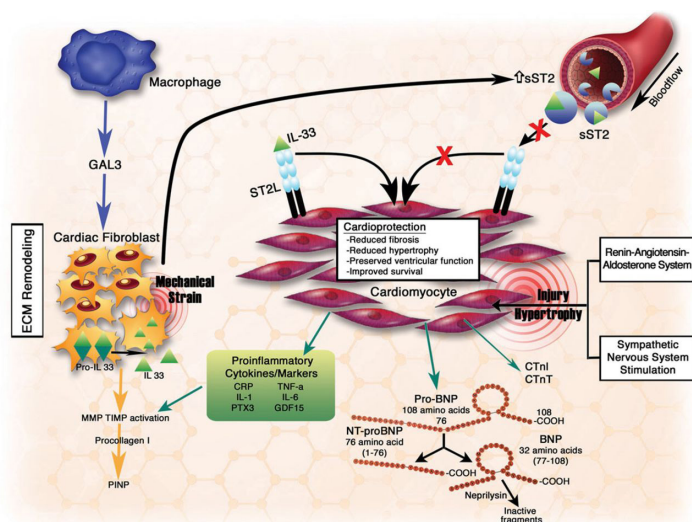

Figure: Role of the biomarker in heart health.
(Source: Rajan et al., 2019)

Conclusion

The related aspects of molecular and biological remarks associated with aging there have no such valid measures. Thus, identification of biomarkers gets complex and does not utilize the required data for the process. The evaluated markers still require proper validation in the process. Several biomarkers are under evaluation here and require related parameters for accessing requirements [15]. Three different kinds of biomarkers have been evaluated in the process and all the related contents like health outcome patterns lack in study factors have been analyzed here. Evaluated aspects of the process are biomarkers in physical capabilities, physiological functions, and cognitive functions that have been analyzed here. The aspects that have been evaluated are prevention aspects. The prevention measures for the aging population about physiological functions have been evaluated here. Treatment measures have also been analyzed for the process. As the biomarkers are still not properly clear for measurement and tools for measurement-do not provides accurate aspects, thus this field of study requires evidence for the process [16]. the aspects of the study that have been presented in the process provide scope for evaluating different areas of human aging and also provides scope for finding out the ethical treatment process instead of treating with drugs that could provide negative results for the aged population. Pre-determined measures could be helpful for a health-aged life here.

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