

How Obesity Affects Our Health

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Abstract: Introduction: Obesity is a form in which there is fat collection of body overweight or adipose tissue. This accumulation happens in lean body mass of muscles and unlike connective tissue. Obesity is consummate constantly defined by the body mass index (BMI), a mathematical formula of weight-for-height index. BMI has a high interaction with adiposity and it interacts well with fat weight at the population rank. Obesity is defined as abnormal all excessive accumulation that may be harmful to health. Although, its etiology has been associated with and energy imbalance between calories consumed and calories expended, which is mainly as a result of a poor diet and insufficient physical exercise. Obesity is a worldwide epidemiologic syndrome depict by fat mass accumulation, mainly visceral fat. Obesity cause several diseases like genetic and metabolic issues, urea cycle problems, turner syndrome, Down syndrome, cystic fibrosis and Wilson's disease etc. Several factors are the cause of obesity like high sugar consumption but by taking some precautionary measures we can be secure from obesity.

Keywords: Adipose tissues, Body mass index, Citrin deficiency, Cystic fibrosis, Turner syndrome, Down syndrome, Pathophysiology.

INTRODUCTION

Obesity is a form in which there is fat collection of body overweight or adipose tissue. This accumulation happens in lean body mass of muscles and unlike connective tissue [1, 2]. Weight loss is an order in which there is loss of gathering body fat or adipose tissue from lean body mass [3]. The BMI is an assay to abundance the measure of tissue mass (muscles, fat and bone) in an idiomatic. Obesity is consummate constantly defined by the body mass index (BMI), a mathematical formula of weight-for-height index. BMI is calculated by part the body weight in kilogram to height in meters squared [4].

Body mass index kg/m^2

Weight (kg)

Height (m) \times height (m)

BMI has a high interaction with adiposity and it interacts well with fat weight at the population rank [5]. It is important to note that the knowing BMI figure can now be invalid because it does not calculate regular body adiposity, does not differentiate between the fat and muscles, nor does it augur body fat dispensation [6]. According to the world health organization (WHO), in 2035, 39% of people in today's society will be affected by obesity. That is why there is now an increased need to create new public polices in prevention and in primary health care. Obesity is defined as abnormal all excessive accumulation that may be harmful to health. Although its etiology has been associated with and energy imbalance between calories consumed and calories expended, mainly as a result of a poor diet and insufficient physical

exercise.

IBW

It is defined as the luscious body weight for a precise age and height [7]. It cannot be calculated direct; there are distinct methods to assess it in children: the McLaren method, the Moore method, and the BMI method [8]. The latter correlates to body fat expedient and can be used to rate IBW in patients aged 2\20 years; at present, it is the confide method to evaluate the IBW [5].

LBW

It is like to conception of fat-free mass (some of vital organs, extra cellular fluid, muscles and bones), but it also involve the fat appreciate in cell membranes, the bone marrow and the nervous system [9].

ABW

It mirror lean body mass plus overmuch fat mass referee by a co-factor (ABW = IBW + co-factor (TBW-IBW) this descriptor is used to does drugs with partial division in adipose tissues in the pediatric population, it is used occasional [7].

PATHOPHYSIOLOGY OF OBESITY

Obesity is a worldwide epidemiologic syndrome depict by fat mass accumulation, mainly visceral fat. The frequency of obesity has doubled in the last three decades, in 2016, according to the WHO, more than 1900 million (39%) people above 18years old were overweight and 600 million (13%) were classified as obese [10], obesity is now proclaim as a current global epidemic by the WHO [8]. Furthermore, obesity is the common denominator of diet-allied chronic diseases such as cardiovascular pathologies or diabetes [11],

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but also chronic inflammatory and allergic disarray [12]. The pathophysiology of obesity is multifactorial, affect in its evolution short life style, neuronal and hormonal mechanisms, as well as genetic and epigenetic factors [13], which result from an imbalance between energy intake and expenditure. Obesity is imposing in practice by body mass index (BMI) or the ratio of waistline to hip girth. High BMI indexes associate with chronic diseases such as hypertension, dyslipidemia, types 2 diabetes [14], cardiovascular diseases, and metabolic syndrome, as well as development of some types of cancers [15]. Genetic factors clearly contribute to the control of physiologic response to caloric excess and hence to the development and maintenance of obesity; heritability estimates for the variance in BMI ranging between 40% to 70%. In human, digestion and absorption mainly occur in the stomach and proximal small intestine [16]. Carbohydrates are vital source of energy for the human body, yet humans have very limited abilities to degrade a use the dietary mono-, oligo-, poly-saccharides; varied members of the gut micro biota [17], known as saccharolytic microorganism, break these complex glycan's thereby providing the host with a variety of metabolites, in particular short chain fatty acid [18]. In healthy individuals, 66-95% of proteins, 85% of carbohydrates [13] and 95% of fats are absorbed before entering the large intestine. On the other hand, it is well known that obesity is sort with chronic low-grade inflammation and insulin resistance [19]. White adipose tissue is metabolically the most important adipose tissue [16], playing a central role in the inflammatory state and expressing pro-inflammatory cytokines such as TNF- α and interleukins [IL]-1, IL-6, IL-10 and IL-12 [20].

OBESITY AND FATTY LIVER DISEASES

Genetic and Metabolic Issues

A grand establishment of genetic and metabolic problems can clinically premium with fatty liver and/or hypertransaminasemia [21]. Despite the fact that inborn errors of metabolic (IEM) can current within the neonatal era with acute signs, sometimes they may manifest only later in infancy or childhood with a NAFLD-like picture and a lack of other specific gesture and clue in those precedent there's a high threat of misdiagnosis. Below we summarize a few examples of this [6].

Urea Cycle Problems

Urea cycle product have very variable clinical donation which may embrace now not peerless rigorous bureaucracy with neonatal span onset however additionally milder forms with onset in adolescence or adulthood [17], turn on the exceptional residual activity of the enzyme bother [22]. It's far ubiquitous to find micro vesicular steatosis on liver histological quiz [23]. Precise, for the reason that ornithine Tran's carbamylase (OTC) deficiency is an X-connected partially dominant ailment; heterozygous females may also

have a balmy shape of the sickness without a clueless anterior jot of hyperammonemia [7].

Citrin Deficiency

That is an unprecedented autosomal recessive urea cycle defect. Farther the neonatal age, when it is prevalently depict via cholestasis, Citrin deficiency may expose as a diffusely fatty liver, that is histologically much like NAFLD [23].

Congenital Hash of Glycosylation

Congenital hash of glycosylation is a group of shuffle that brings about bad synthesis of glycoproteins or glucolipids [19]. In a few forms, clinical paucisymptomatic, remoted steato-fibrotic liver involvement can be the best or customary indication [24].

Turner Syndrome

Liver involvement is likewise a frequent difficulty for sufferers with Turner syndrome [25]. Hypertransaminasemia [13] steatosis, steatofibrosis and steatohepatitis are the maximum regularly reported liver-sort situations [15]. The causes of liver harm are very heterogeneous, as they range from obesity and insulin resistance, to an elevated predisposition to autoimmunity, to hepatotoxicity from substitutive hormonal treatments [7].

Down Syndrome

Non-alcoholic fatty liver disease is a common comorbidity of Down syndrome, possibly due to terrible bodily activity [26]. In those sufferers, obesity and obstructive sleep apnea syndrome-associated nocturnal hypoxia, by inducing oxidative stress in the liver, may additionally constitute extra risk factors triggering NAFLD and its development to extra intense forms [23].

Cystic Fibrosis

CF is the max usual severe autosomal recessive ailment Caucasians imparting with the multiorgan involvement [7]. It effects from mutations in the CF transmembrane conductance regulator (CFTR). CF associated liver disease (CFLD) has become one of the leading causes of morbidity and mortality in CF sufferers [24]. Hepatic steatosis is occasionally related to CF [4]. it does no longer appear related to CFTR secretory defects but is likely related to selective nutritional deficiencies an altered phospholipids metabolism [21].

Shwachman-Diamond Syndrome

Hepatomegaly and amino transferase elevation is found in max sufferers with Shwachman-Diamond syndrome [9]. As with CF, liver bruise can sometimes be the preliminary manifestation of this sickness [27]. The mechanism of liver hardship isn't always absolutely clean, although autoimmune-like liver ailment and antigliadin antibody tremendous inflammatory enteropathy may probably be

worried [7].

Wilson's Disorder

Wilson's indisposition has an estimated prevalence of 1 in 30,000; however it's far higher in china, japan, and Sardinia in Italy [3]. WD is characterized through copper accumulation in the body [13], especially inside the liver and the mind [1]. It is because of mutation of the ATP7B gene that leads to dysfunction of the copper-transported enzyme P-kind ATPase [28], this enzyme is liable for transported copper into bile and incorporating it into ceruloplasmin [25]. The protein is synthesized by the liver and is the foremost copper provider in the blood [29, 30]. A discount of ceruloplasmin in the plasma is a sign of WD [23]. Although copper starts to accumulate in the liver from first few year of life onwards [31, 32]. The only sign being fatty liver and hypertransaminasemia, a symptomatic and revolutionary liver disorder appears later [19]. A prognosis of WD is normally trustworthy in children with advanced liver sickness, as the classical biochemical function of disturbed copper metabolism are typically present [21]. As talked about via the ESPGHAS, organizing are prognosis of WD in younger asymptomatic youngsters with mild liver disease is [33], however, frequently difficult given that there ceruloplasmin tiers and urinary copper excretion may be every day [14] and Kayser-Fleischer rings absent [34]. In scientific practice, the degree of steatosis is correlated with hepatic parenchymal copper attention [3].

Gastrointestinal and Nutrition Diseases

Celiac disorder celiac disease may be associated with hypertransaminasemia and fatty liver disease "Celiac hepatitis" is the utmost common place hepatopathy in those tolerant and is depict through slightest and non-precise histological liver lesions [6]. These deals are commonly reversible after just a few months following the start of a gluten-free diet in cases of fatty liver which are not responsive to a gluten-unfastened food plan it's far important to exclude different causes of liver damage [35], inclusive of obesity and other illness affecting the liver, such as autoimmune hepatitis, autoimmune cholangitis, and overlap syndrome [30].

Inflammatory Bowel Disorder

IBD is associated with motley hepatobiliary problems. With IBD, the prevalence of liver disorder rises from three% to fifty%, in step with definitions utilized in distinctive studies [36]. Fatty liver is taken into consideration the max not unusual hepatobiliary complication in inflammatory bowel illnesses whilst number one sclerosing cholangitis is the most specific worry [23]. But, it need to be identified that fatty in filtration can be directly related to these verity of IBD, and to malnutrition and corticosteroid use [31]. As IBD improves and a higher nutritional repute is maintained, the fatty liver infiltration may additionally improve and be reversible [30].

Malnutrition

IA few systemic illnesses such as severe malnutrition, cachexia and anorexia nervosa can lead to fatty liver [15]. Hunger causes hepatocyte damage and loss of life, leading to an upward thrust in aminotransferases [6]. Weight reduction can produce slight elevation of transaminases; however alanine aminotransferase (ALT) and aspartate aminotransferase (AST) elevation can also occur early within the route of refeeding [37], if dextrose calories are excessive, and is referred to as steatosis [5]. In fact, during starvation, US typically reveal that the liver is small in size, whilst in "refeeding hepatitis", US suggests an enlarged fatty liver [4].

FACTORS OF OBESITY

Genetics

Your genes may affect the quantity of body fats you keep, and where that fat is distributed [21, 38]. Genetics can also play a function in how efficaciously your body converts meals into strength and how your frame burns energy at some stage in workout [26].

Family Life-Style

Weight problems have a tendency to run in families. If one or each of your parents is obese, your threat of being obese is extended [6]. That's not just due to genetics. Family individuals generally tend to proportion comparable eating and activity habits [32].

Inactivity

In case you're no longer very lively, you do not burn as many energy [6]. With a sedentary way of life, you can easily absorb more calories each day than you burn through exercising and ordinary day by day sports [25].

Loss of Sleep

Not getting sufficient sleep or getting an excessive amount of sleep can cause adjustments in hormones that growth your appetite [22]. You can also crave ingredients excessive in energy and carbohydrates [2], which can contribute to weight advantage [26].

Bad Food Plan

A food regimen that's high in energy, missing in culmination and veggies, complete of fast food [39] and laden with high-calorie drinks and outsized portions contributes to weight benefit [23].

Much Less Exercising

Weight problems are likewise because of low excretion and extra energy consumption [8]. Sheer strength of mind is a want, if someone desires to eliminate from weight problems [15].

Sugar Consumption

Whilst fed on in extra quantity sugar adjustments the hormones and biochemistry of the body, contributing to weight advantage [23]. Sugar is half glucose and ½ fructose [13]. Extra fructose intake reasons insulin and leptin resistance and extended insulin tiers [13]. All of those make contributions to fat garage and inflicting weight problems [21].

Complications

If the human are obese, than to develop a numbers of potentially serious health problems, including [13],

- Type 2 diabetes.
- High blood pressure.
- Metabolic syndrome.
- Heart disease.
- Stroke.
- Gallbladder diseases.
- Nonalcoholic fatty liver disease.
- Breathing disorders.
- Cancers.
- Osteoarthritis.

HOW WE CAN BE SECURE FROM OBESITY

Cut Back on Sugar and Starch

When we reduce the use of sugar and starch it made the person less hungry and results in less consumption of calories [19]. Instead of using fats for energy [32]. Body starts feeding off-stored fats [36], the insulin level also lowers that helped kidneys to remove high quantity of sodium and water out of the body [23]. It reduced the bloat and unnecessary water weight in body [21].

Eat Protein Fat and Vegetables

The meals should include protein source and low-carbohydrate vegetables [25]. When the meals constructed in this way they would automatically bring food intake into the recommended range of 20-50 grams per day [27].

Reduce Weights 3 Times per Week

By the use of exercise and proper diet one can reduce the body weight three times per week [22], it would also provide relief from obesity [21].

Avoid Sugary Drinks and Fruit Juice

As the contain the sugar and carbohydrates which cause the fat accumulation in body so the person should avoid sugary drinks and fruit juice to secure from obesity [40].

Drink Water a Half Hour Before Meal

Recent studies showed that by drinking water half hour before

meal will weight loss by 44% over 3 months [4].

Eat Soluble Fiber

Recent studies also showed that it may reduce fat, especially in the belly area [29]. Fiber supplements like glucomannan can also help in weight loss [19].

Drink Coffee or Tea

Caffeine is present in coffee and tea that can boost our metabolism by 3-11%.

Eat Your Food Slowly

As the food is eaten slowly so the metabolism will work fast and work properly. The meal should be taken slowly it would also reduce the chances of obesity [20].

Weigh Yourself Every Day

Studies showed that people who weigh themselves every day are much more likely to lose weight [5]. As it relax the human mental status and provide help in weight loss.

Get a Good Night Sleep, Every Night

Person who sleeps is one of the strongest risk factors for weight gain, so taking care of sleep is important [3].

CONCLUSION

Obesity is a form in which there is fat collection of body overweight or adipose tissue. The frequency of obesity has doubled in the last three decades, it is now proclaim as epidemic worldwide. People are being affected by the diseases caused by obesity. But the cure of these diseases caused by obesity is present by taking the precautionary measures we can be secure from obesity.

CONFLICT OF INTEREST

Declared none.

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REFERENCES

- [1] Hora S, Pandey AK, Jha S. Biomarker-Based Targeted Therapeutics. In: Neoplasms. UK: IntechOpen 2018; [cited 2019 Jul 29]; Available from: https://www.researchgate.net/profile/Shainan_Hora/publication/327744760_Biomarker-Based_Targeted_Therapeutics/links/5ba208f692851ca9ed14e5df/Biomarker-Based-Targeted-Therapeutics.pdf
- [2] Halpern B, Halpern A. Why are anti-obesity drugs stigmatized? *Expert Opin Drug Safety* 2015; 14(2): 185-9. DOI: 10.1517/14740338.2015.995088

- [3] Shahnazi H, Abdolalian N, Kazemi A, Hassanzadeh A. Designing an educational intervention to prevent excessive gestational weight gain: A protocol for a randomized controlled trial. *Reprod Health* 2019; 16(1): 31. DOI: 10.1186/s12978-019-0696-7
- [4] Friend DM, Devarakonda K, Neal TJO, *et al.* Basal ganglia dysfunction contributes to physical inactivity in obesity. *Cell Matab* 2017; 25(2): 312-21. DOI: 10.1016/j.cmet.2016.12.001
- [5] Gheflati A, Mohammadi M, Jolfaie NR, Heidari Z, Abargouei AS, Nadjarzadeh A. Does pomegranate consumption affect weight and body composition? A systematic review and meta-analysis of randomized controlled clinical trials. *Phytotherapy Res* 2019; 33(5): 1277-88. DOI: 10.1002/ptr.6322
- [6] Brostow DP, Warsavage TJ, Abbate LM, *et al.* Mental illness and obesity among Veterans undergoing percutaneous coronary intervention: Insights from the VA CART program. *Clin Obes* 2019; 9(2): e12300. DOI: 10.1111/cob.12300
- [7] Alfani R, Vassallo E, De Anseris A, *et al.* Pediatric fatty liver and obesity: Not always just a matter of non-alcoholic fatty liver disease. *Children (Basel)* 2018; 5(12). pii: E169. DOI: 10.3390/children5120169
- [8] Phillips S, Edlbeck A, Kirby M, Goday P. Ideal body weight in children. *Nutr Clin Pract* 2007; 22(2): 240-5. DOI: 10.1177/0115426507022002240
- [9] Rao W, Zhang J, Zong Q, An F, Ungvari GS. Prevalence of depressive symptoms in overweight and obese children and adolescents in mainland China: A meta-analysis of comparative studies and epidemiological surveys. *J Affect Disord* 2019; 250: 26-34. DOI: 10.1016/j.jad.2019.02.045
- [10] Zachwieja J, Hentges E, Hill JO, Black R, Vassileva M. Public-private partnerships: The evolving role of industry funding in nutrition research. *Adv Nutr* 2013; 4(5): 570-2. DOI: 10.3945/an.113.004382
- [11] Ankichetty S, Angle P. 2013 Case report: Rhabdomyolysis in morbidly obese patients: Anesthetic considerations. *Can J Anaesth* 2013; 60(3): 290-3. DOI: 10.1007/s12630-012-9823-4
- [12] Branco S, Jorge M do S, Chaves H. Obesidade Infantil A Realidade de Um Centro de Saúde. *Acta Med Port* 2011; 24: 509-16.
- [13] Huang H, Wan C, Mohamed W, Jenatabadi HS. Family environment and childhood obesity: A new framework with structural equation modeling. *Int J Environ Res Public Health* 2017; 14(2): 181. DOI: 10.3390/ijerph14020181
- [14] Robroek SJ, Reeuwijk KG, Hillier FC, Bambra CL, van Rijn RM, Burdorf A. The contribution of overweight, obesity, and lack of physical activity to exit from paid employment: A meta-analysis. *Scand J Work Environ Health* 2013; 39: 233-40. DOI: 10.5271/sjweh.3354
- [15] Donoso FA, Ulloa VD, Contreras ED, Arriagada SD. Childhood obesity: Pharmacokinetic considerations for drugs used in the intensive care unit. *Arch Argent Pediatr* 2019; 117: 121-30. DOI: 10.5546/aap.2019.eng.e121
- [16] Lemamsha H, Papadopoulos C, Randhawa G. Understanding the risk and protective factors associated with obesity amongst Libyan adults - a qualitative study. *BMC Public Health* 2018; 18(1): 493. DOI: 10.1186/s12889-018-5411-z
- [17] Tanoubi I, Drolet P, Donati F. Optimizing preoxygenation in adults. *Can J Anaesth* 2009; 56(6): 449-66. DOI: 10.1007/s12630-009-9084-z
- [18] Patneedi CB, Prasadu KD. Impact of pharmaceutical wastes on human life and environment. *RJC* 2015; 8(1): 67-70.
- [19] Levin BE. Why some of us get fat and what we can do about it. *J Physiol* 2007; 583(2): 425-30. DOI: 10.1113/jphysiol.2007.135434
- [20] Mavanji V, Billington CJ, Kotz CM, Teske JA. Sleep and obesity: A focus on animal models. *Neurosci Biobehav Rev* 2012; 36(3): 1015-29. DOI: 10.1016/j.neubiorev.2012.01.001
- [21] Güngör NK. Overweight and obesity in children and adolescents. *J Clin Res Pediatr Endocrinol* 2014; 6(3): 129-43. DOI: 10.4274/jcrpe.1471
- [22] Sonne-Holm S, Sørensen TI, Christensen U. Risk of early death in extremely overweight young men. *Br Med J (Clin Res Ed)* 1983; 287(6395): 795-7. DOI: 10.1136/bmj.287.6395.795
- [23] Byrne ME, Lemay-Russell S, Tanofsky-Kraff M. Loss-of-control eating and obesity among children and adolescents. *Curr Obes Rep* 2019; 8(1): 33-42. DOI: 10.1007/s13679-019-0327-1
- [24] Asirvatham J, Thomsen MR, Nayga RM, Goudie A. Economics and human biology do fast food restaurants surrounding schools affect childhood obesity? *Econ Hum Biol* 2019; 33: 124-33. DOI: 10.1016/j.ehb.2019.01.011
- [25] Paciência I, Mendes F, Rufo JC, *et al.* Exposure to indoor endocrine-disrupting chemicals and childhood asthma and obesity. *Allergy* 2019; 74(7): 1277-91. DOI: 10.1111/all.13740
- [26] Mohorko N, Černelič-Bizjak M, Poklar-Vatovec T, *et al.* Weight loss, improved physical performance, cognitive function, eating behavior, and metabolic profile in a 12-week ketogenic diet in obese adults. *Nutr Res* 2019; 62: 64-77. DOI: 10.1016/j.nutres.2018.11.007
- [27] van Dammen L, Wekker V, de Rooij SR. The effects of a pre-conception lifestyle intervention in women with obesity and infertility on perceived stress, mood symptoms, sleep and quality of life. *PLoS One* 2019; 14(2): e0212914. DOI: 10.1371/journal.pone.0212914

- [28] Mrowietz U, Steinz K, Gerdes S. Psoriasis: To treat or to manage? *Exp Dermatol* 2014; 23(10): 705-9. DOI: 10.1111/exd.12437
- [29] Shan L. Bimodal lentiviral vector encoding myc-tagged human ferritin heavy chain and green fluorescent protein (GFP). *Molecular Imaging and Contrast Agent Database (MICAD)* [Internet]. Bethesda (MD): National Center for Biotechnology Information (US); 2004-2013. 2011; [updated 2011 Mar 09].
- [30] Krystia O, Ambrose T, Darlington G, *et al.* A randomized home-based childhood obesity prevention pilot intervention has favourable effects on parental body composition: Preliminary evidence from the Guelph Family Health Study. *BMC Obes* 2019; 6: 10. DOI: 10.1186/s40608-019-0231-y
- [31] Cohen AK, Abrams B. Educational attainment and obesity: A systematic review. *Obes Rev* 2013; 14: 989-1005. DOI: 10.1111/obr.12062
- [32] Bannan LT. ABC of blood pressure reduction. *Br Med J* 1980; 281(6246): 982-4. DOI: 10.1136/bmj.281.6246.982
- [33] Haque AKMA, Dewerth A, Antony JS, *et al.* Chemically modified hCFTR mRNAs recuperate lung function in a mouse model of cystic fibrosis. *Sci Rep* 2018; 8: 16776. DOI: 10.1038/s41598-018-34960-0
- [34] Institute of Medicine. *Child and Adult Care Food Program: Aligning Dietary Guidance for All*. Washington, DC: The National Academies Press 2011; DOI: 10.17226/12959
- [35] Pastrana DV, Peretti A, Welch NL, *et al.* metagenomic discovery of 83 new human papillomavirus types in patients with immunodeficiency. *mSphere* 2018; 3(6). pii: e00645-18. DOI: 10.1128/mSphereDirect.00645-18
- [36] Jabbar A, Irfanullah A, Akhter J. Dyslipidemia and its relation with body mass index versus waist hip ratio. *J Pak Med Assoc* 1997; 47(12): 308-10.
- [37] Steinsbekk S, Belsky D, Guzey IC, Wardle J, Wichstrøm L. Polygenic risk, appetite traits, and weight gain in middle childhood: A longitudinal study. *JAMA Pediatr* 2016; 170(2): e154472. DOI: 10.1001/jamapediatrics.2015.4472
- [38] Finkelstein EA, Ruhm CJ, Kosa KM. Economic causes and consequences of obesity *Ann Rev Public Health* 2005; 26: 239-57. DOI: 10.1146/annurev.publhealth.26.021304.144628
- [39] Zhang H, Chen Z, Du M, Li Y, Chen Y. Enhanced gene transfection efficiency by low-dose 25 kDa polyethylenimine by the assistance of 1.8 kDa polyethylenimine. *Drug Deliv* 2018; 25: 1740-5. DOI: 10.1080/10717544.2018.1510065
- [40] Zhang W, Mao J, Shen Y, *et al.* Evaluation of the activity levels of rat FVIII and human FVIII delivered by adeno-associated viral vectors both *in vitro* and *in vivo*. *Blood Cells Mol Dis* 2018; 73: 47-54. DOI: 10.1016/j.bcmd.2018.09.004

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