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> ea. RAMIJA The Title of Bachelor Of Medicine

AS BRAWILS

By : Kalaiyarasi A/P Vengadesan 155070108121008

### MEDICINE STUDY PROGRAMME

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### APPROVAL PAGE FINAL ASSIGNMENT

### RELATIONSHIP BETWEEN METABOLIC COMPONENTS (FASTING BLOOD GLUCOSE

### LEVEL AND BLOOD PRESSURE) AND NORMAL-TENSION GLAUCOMA (NTG)

To fulfill the Requirement for Degree of Bachelor of Medicine

By: Kalaiyarasi A/P Vengadesan 155070108121008

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ABSTRACT Un Vengadesan, Kalaiyarasi. 2019. Relationship Between Metabolic Components as Brawijava (Fasting Blood Glucose and Blood Pressure) and Normal-Tension awijaya Glaucoma (NTG). Final assignment, Medical Study Program, Faculty of Medicine, Universitas Brawijaya, Malang. Supervisors: (1) dr. Aulia Abdul Itas Brawijaya awijaya awijaya Universita Hamid, M.BiomedSc, Sp.M(K) (2) dr. Andhika Yudistira, Sp.OT(K). Universitas Brawijaya awijaya awijaya awijaya Universita Glaucoma refers to a group of eye diseases associated with characteristic it as Brawlaya Unistructural damage to the optic nerve due to excessively high intraocular pressures tas Brawijava awijaya (IOP). Metabolic syndrome (MS) is defined as a cluster of heart attack risk factors Brawijava awijaya such as diabetes, pre-diabetes, obesity, high cholesterol and high blood pressure. awiiava The purpose of this study is to determine the relationship between metabolic awijaya components (fasting blood glucose and blood pressure) and normal-tension awijaya glaucoma. This study was an observational study with cross-sectional approach.sitas Brawijaya The samples (30) were taken consequently from patients in Poli Mata RS Saiful it as Brawijava awijaya Anwar who were diagnosed with metabolic syndrome. Their fasting glucose levels awijaya and blood pressure were measured. They are later sent to the Poli mata divisi awijaya Glaukoma dan Neurooftalmologi to test for normal-tension glaucoma. Shapiro-Wilk test is used because the data are less than 50. There results showed sig = 0.000 it as Brawijaya awijaya Uni <0.05. Thus, the data is not normally distributed and Mann-Whitney test is used.</p> awijaya The significance of SBP is 0.318, DBP is 0.316 and FBG is 0.191 which are more than Brawlava awijaya than 0.05 (sig.> 0.05). As the data was not normally distributed, it is normalized awijaya and T-test was used. The results showed the significance value of SBP, DBP and awijaya FBG are 0.955, 0.253 and 0.293 respectively which are >0.05. Based on the las Brawlaya Universities, it is concluded that metabolic components, fasting blood glucose and blood stas. Brawijava awijaya pressure have no significant relationship with normal-tension glaucoma. awijaya

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Uni **Keywords:** Metabolic Syndrome, Normal-Tension Glaucoma, Fasting Blood iversitas Brawijaya Uni Glucose, Blood Pressure

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Universitas ABSTRAK Uni Vengadesan, Kalaiyarasi. 2019. Relationship Between Metabolic Components as Brawijava (Fasting Blood Glucose and Blood Pressure) and Normal-Tension Glaucoma (NTG Tugas Akhir, Program studi Kedokteran, Fakultas awijaya awijaya SITA Kedokteran, Universitas Brawijaya, Malang, Pembimbing: (1) dr. Auliasitas Brawijaya awijaya Universita Abdul Hamid, M.BiomedSc, Sp.M(K) (2) dr. Andhika Yudistira, Sp.OT(K). isitas Brawijaya awijaya awijaya awijaya Glaukoma merupkan sekelompok penyakit mata yang terkait dengan sitas Brawijaya Uni kerusakan struktural khas pada saraf optik karena tekanan intraokular yang terlalusitas Brawijaya awijaya tinggi (IOP). Sindroma metabolik (MS) didefinisikan sebagai sekelompok faktorsitas Brawijaya awijaya risiko serangan jantung seperti diabetes, pra-diabetes, obesitas, kolesterol tinggi awiiava dan tekanan darah tinggi. Tujuan dari penelitian ini adalah untuk mengetahui hubungan antara komponen metabolisme (glukosa darah puasa dan tekanan sitas Brawijaya awijaya awijaya darah) dan normo-tensi glaukoma. Penelitian ini adalah penelitian observasionalitas Brawijaya dengan pendekatan cross-sectional. Sampel (30) diambil secara dari pasien di Polisitas Brawijava awijaya Mata RS Saiful Anwar yang didiagnosis dengan sindroma metabolik. Kadar awijaya glukosa puasa dan tekanan darah mereka diukur. Mereka kemudian dikirim ke Poli awijaya mata divisi Glaukoma dan Neurooftalmologi untuk menguji normo-tensi glaukoma. awijaya Uji Shapiro-Wilk digunakan karena datanya kurang dari 50. Ada hasil yang itas Brawijaya menunjukkan sig = 0,000 <0,05. Dengan demikian, data tidak terdistribusi secara itas Brawijaya awijaya normal dan uji Mann-Whitney digunakan. Signifikansi SBP adalah 0,318, DBP itas Brawijaya awijaya 0,316 dan FBG adalah 0,191 yang lebih dari 0,05 (sig.> 0,05). Karena data tidak awijaya terdistribusi normal, dinormalisasi dan T-test digunakan. Hasil penelitian menunjukkan nilai signifikansi SBP, DBP dan FBG masing-masing adalah 0,955, itas Brawijaya awijaya Uni 0,253 dan 0,293 yaitu> 0,05. Berdasarkan hasil, disimpulkan bahwa komponensitas Brawijaya awijaya metabolisme, glukosa darah puasa dan tekanan darah tidak memiliki hubungan itas Brawijaya awijaya yang signifikan dengan normo-tensi glaukoma. awijaya awijaya awijaya

### **Kata Kunci**: Sindroma Metabolik, Normo-Tensi Glaukoma, Glukosa Darah Puasa, Tekanan Darah

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awijaya awijaya CHAPTER 1 awijaya UniversitINTRODUCTION niversitas Brawijava awijaya awijaya awijaya 1.1 Background awijaya Universitas Brawijaya awijaya According to World Health Organization (WHO), glaucoma (12.3%) is the awijaya awijaya second leading cause of blindness in all areas of earth after cataract (47.9%) awijaya (WHO, 2004). Around 66.8 millions of the world's population are suffering from the Brawlava awiiava awijaya glaucoma. awijaya awijaya Glaucoma refers to a group of eye diseases associated with characteristic awijaya awijaya structural damage to the optic nerve due to excessively high intraocular pressure awijaya awijava (IOP). Although the exact theory of glaucoma is not clear, some factors such as the Braw awijaya high intraocular pressure (IOP), asymmetrical cup-disk ratio, and increased cupawijaya awijaya disk ratio and disc hemorrhage are said to be behind glaucoma. awijaya awijaya Metabolic syndrome (MS) is defined as a cluster of heart attack risk factors such awijaya awijava as diabetes, pre-diabetes, obesity, high cholesterol and high blood pressure tas Brawlaya awijaya (International Diabetes Foundation, 2016). Current studies show that elevated awijaya awijaya intraocular pressure is associated with metabolic complications and insulin awijaya awijaya resistance (Oh SW, 2005). Although diabetes is associated with an elevated awijaya intraocular pressure (IOP), the underlying mechanisms are still unclear (The awijaya Glaucoma Foundation, 2015). awijaya Only small amounts of people who are affected by glaucoma are aware about the disease because of its asymptomatic nature in the early stage. This results in delayed treatment and eventually causes blindness (Robert N, 2014).

awijaya awijaya The purpose of this study is to assess the relationship between metabolic components (fasting blood glucose level and blood pressure) and normal-tension Un glaucoma in patients with metabolic syndrome. The results of this study might it as Brawijava awijaya contribute to an explanation about the relationship between glaucoma, intraocular awijaya awijaya Unipressure and metabolic syndrome. Therefore, it can be used in the treatment and it as Brawijaya awijaya prevention of glaucoma in metabolic syndrome patients. awijaya awijaya awijaya awijaya BR awiiava 1.2 Problem Formulation awijaya awijaya What is the relationship between fasting blood glucose level and normal-tension awijaya awijaya glaucoma? awijaya awijaya What is the relationship between blood pressure and normal-tension glaucoma? awijaya awijaya 1.3 Purpose of Research awijaya awijaya Uni 1.3.1 General Purpose awijaya awijaya United To determine the relationship between metabolic components (fasting blood it as Brawijaya awijaya awijava glucose level and blood pressure) and normal-tension. awijaya awijaya awijaya 1.3.2 Specific Purpose awijaya awijaya To determine the relationship between fasting blood glucose level and awijaya awijaya Universita normal-tension glaucoma (NTG).vijaya Universitas Brawijaya awijaya b. To determine the relationship between blood pressure and normal-tension awijaya Universitas glaucoma (NTG). awijaya

awijaya awijaya 1.4 Benefit of Research awijaya Univ1.4.1 Academic Benefits versitas Brawijaya Universitas Brawijaya awijaya Univer a. To increase the knowledge about occurrence of glaucoma in elevated tas Brawijaya awijaya awijaya Universita fasting blood glucose level and blood pressure. Stas Brawijaya awijaya b. Can serve as a theoretical basis to add knowledge for future research awijaya awijaya awijaya Universita development in glaucoma. awijaya awijaya BRA awijaya 1.4.2 Practical Benefits awijaya awijaya Can be used as basis of early detection and prevention of glaucoma a. awijaya awijaya among metabolic patients. awijaya A 5 awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya

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2.1.1 Definition

Universitas Brawijaya Universitas Brawijaya CHAPTER 2 UnivREVIEW OF LITERATURE sitas Brawijava

Metabolic syndrome is a cluster of atherosclerotic risk factors that increase a person's chance of developing heart disease, diabetes and stroke. These factors

include obesity, impaired glucose tolerance (IGT) or diabetes, hypertension, insulinates Brawijaya

resistance, dyslipidemia and hyperinsulinemia (K Imai et al., 2010).

### Uni 2.1.2 Diagnostic Criteria

awijaya UnivAccording to the National Cholesterol Education Program Third Adult Treatment it as Brawlaya awijaya Panel (NCEP ATP III), modified according to Asian populations, several criteria are awijaya included in the diagnostic criteria. Those criteria include waist circumference > awijaya awijaya Uni 90cm for men and > 80cm for women, Triglyceride > 150mg/dL, HDL-C < 40mg/dLsitas Brawijaya awijaya awijaya in men and < 50 mg/dL in women, systolic blood pressure > 130mmHg or diastolic awijaya awijaya blood pressure > 85mmHg or antihypertensive drug treatment and fasting blood awijaya Uniglucose (FBG) > 100mg/dL (Grundy et al., 2005). versitas Brawijava awijaya awijaya awijaya awijaya awijaya awijaya

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	awijaya	Universitas Elevated Waist Circumference <sup>a</sup>	<u>&gt;</u> 102 cm in males <u>&gt;</u>	88 cmersitas Brawijaya
	awijaya	Universitas Brawijaya	sitas in females	Universitas Brawijaya
	awijaya	Universitas Brawii	s Brawijaya	Universitas Brawijaya
	awijaya	Universitas Brz		Universitas Brawijaya
	awijaya	Elevated triglycerides(drug treatment for elevated	<u>&gt;</u> 150 mg/dL (1.7 mr	nol/L)ersitas Brawijaya
	awijaya	University triglycerides is an alternate indicator <sup>b</sup> )	va	Universitas Brawijaya
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	awijaya	Reduced HDL-C(drug treatment for reduced HDL-		ol/L) in rsitas Brawijaya
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	awijaya	Un S	mmol/L) in female	es niversitas Brawijaya
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	awijaya	Un Elevated blood pressure(antihypertensive drug	Systolic <u>&gt;</u> 130 and	d/oriversitas Brawijaya
	awijaya	Unive treatment in a patient with a history of	diastolic <u>&gt;</u> 85 mm	Hgiversitas Brawijaya
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	awijaya	Univer Elevated fasting glucose <sup>c</sup> (drug treatment of	<u>&gt;</u> 100 mg/dl	Universitas Brawijaya
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Table 2.2 Country	/Ethnic Specific Values	for Waist Circumference	(Alberti Sitas Brawijay
Iniversitas Brawijaya	<b>G, 2006).</b> Universitas Brawijaya	a Universitas Brawijaya	Universitas Brawijay
Iniversitas Brawijaya	Universitas Brawijaya	a Universitas Brawijaya	Universitas Brawijay
Iniversitas Brawijava	Universitas Brawijava	a Universitas Brawijava	Universitas Brawijay
Iniv		ist Circumference	as Brawijay
Jniv		sure of Central Obesity)	——— as Brawijay
Ini		ale ≥94 cm male ≥80 cm	as Brawijay
Ini South Asians	Ma	ale ≥90 cm	as Brawijay
Univ Chinese		male ≥80 cm ale ≥90 cm	as Brawijay
Ini		male $\geq$ 80 cm	as Brawijay

\*These are pragmatic cut points and better data are required to link them to risk. Ethnicity should be the basis for classification, not the country of residence.

Male ≥85 cm

Female ≥90 cm

2.2 Glaucoma

Japanese

### Uni 2.2.1 Definition

awijaya

awijaya Uni Glaucoma is a group of disorders characterized by a progressive optic awijaya

neuropathy resulting in characteristic changes in the optic nerve head and inversitas Brawijaya awijaya

corresponding loss of visual field that are associated frequently but not invariably Sitas Brawijaya awijaya awijaya

Uni with raised intraocular pressure (IOP). IOP is the most common risk factor. Iniversitas Brawijaya

However, it is not the only risk factor for development of glaucoma. In cases with

Univraised IOP without any associated glaucomatous damage, the term 'ocular inversitas Brawijaya awijaya Uni hypertension' is used (A K Khurana, 2007) aya Universitas Brawijaya awijaya awijaya awijaya awijaya awijaya

2.2.2 Classification Primary Open Angle Glaucoma (POAG) awijaya awijaya POAG is a type of primary glaucoma. There is no obvious systemic or ocular awijaya cause of rise in the intraocular pressure (IOP). POAG occurs in eyes with open awiiava awijaya angle of the anterior chamber. POAG is also a chronic simple glaucoma of adult awijaya Unionset. It is characterized by slowly progressive raised intraocular pressure (>21) tas awijaya awijaya mmHg recorded on at least a few occasions) associated with characteristic optic awiiava awijaya disc cupping and specific visual field defects (A K Khurana, 2007). POAG usually awijaya has no symptoms. The rise of pressure in the eye is slow and the cornea adapts awijava awijaya without swelling. Thus, this disease often goes undetected. In addition, it is awiiava awijaya painless and the patient often does not realize about the condition until the disease awijava reaches the later stages. Hence, the damage is irreversible by the time the vision awijaya awijaya is impaired (The Glaucoma Foundation, 2018). In order to prevent this, it is awijaya Un advisable that all patients over 40 years old to get periodic measurement of awijaya awijaya intraocular pressure (IOP). Furthermore, relatives of patients with chronic openawijava awijava angle glaucoma should be reviewed regularly. As for the treatment for glaucoma, stars awijaya it can be either medical, via laser or surgical. Medical treatment of glaucoma aims awijaya awijaya to control the intraocular pressure (IOP) with the use of eye drops. The eye drops awijaya awijaya acts by inhibiting the production of aqueous or promoting greater aqueous outflow. awijaya When medical treatment fails or unsatisfactory, laser trabeculoplasty may be used. awijaya It involves laser treatment of trabecular meshwork. In case both the medical treatment and laser trabeculoplasty are ineffective, trabeculectomy is performed (Arthur, 2007).

B. Normal Tension Glaucoma (NTG) Normal tension glaucoma (NTG) is a variant of POAG. It is also known as low tas Brawlaya tension glaucoma. It happens when typical glaucomatous disc changes with or awijaya awijaya without visual field defects and associated with an intraocular pressure (IOP) awijaya constantly below 21 mmHg. Characteristically the angle of anterior chamber is the Brawn awijaya awijaya open on gonioscopy and there is no secondary cause for glaucomatous disc awijaya awijaya Unichanges. NTG is a result of chronic low vascular perfusion, which subsequently it as Brawl awijaya makes the optic nerve head susceptible to normal intraocular pressure (IOP). awiiava awijaya Medical treatment aims to lower IOP by 30% (12-14 mmHg). Betaxolol is the drug awijaya awijaya Uni of choice because other than lowering IOP, it also increases optic nerve blood flow.sitas Brawl awijaya Apart from that, when progressive field loss occurs despite IOP in lower teens, awijaya awijaya trabeculectomy may be considered. In patients with confirmed peripheral awijava Uni vasospasm, systemic calcium channel blockers such as nifedipine can be used (Asitas Brawijava awijaya awijaya K Khurana, 2007). awijaya awijaya C. Primary Angle-Closure Glaucoma (PACG) awijaya awijaya awijava Primary angle-closure glaucoma (PACG) is characterized by elevated IOPSITAS Brawijaya awijaya resulting from partial or complete occlusion of the angle by the iris (James C. Tsai, itas Brawijava awijaya awijaya 2011). The rise in intraocular pressure occurs when the aqueous humor outflow is awijaya awijaya blocked by closure of a narrower angle of the anterior chamber. According to awijaya Uniclinical presentation, the PACG can be classified into five different clinical groups: tas Braw awijaya awijaya latent primary angle-closure glaucoma, subacute (intermittent) primary angleclosure glaucoma, acute primary angle-closure glaucoma, postcongestive angle-Un closure glaucoma, chronic primary angle-closure glaucoma and a absolute tas Brawijava glaucoma (A K Khurana, 2007). as Brawijaya Universitas Brawijaya

awijaya awijaya D. Secondary Glaucoma Univer In secondary glaucoma, a disease that blocks the outflow channel of the tas Brawijava aqueous may increase the intraocular pressure (IOP). For example, in severe awijaya awijaya iridocyclitis, the inflammatory proteins and cells or iris adhesions may block up the awijaya outflow channel. In hyphema where there is blood in the anterior chamber, the tas Brawlava awijaya awijaya blood may block the outflow channel. Rubeosis iridis, which may develop following awijaya awijaya Concentral retinal vein occlusion and proliferative diabetic retinopathy, may lead to tas Brawl awijaya secondary hemorrhagic glaucoma (neovascular glaucoma). At times, glaucoma is awiiava awijaya a complication of a mature cataract or intraocular tumors (Arthur, 2007). awijaya awijaya 2.2.3 Epidemiology awijaya awijaya awijaya It is estimated that by the year 2020, there will be almost 80 million people in the awijava world with open-angle glaucoma and angle-closure glaucoma. The majority of awijaya awijaya them will have open-angle glaucoma. It is predicted that 70% of the angle-closure awijaya Uniglaucoma will be women and 87% will be Asian. Bilateral blindness from glaucoma awijaya awijaya is estimated to affect greater than 11 million individuals worldwide by 2020. It is awijaya awijaya believed globally that glaucoma is a significant cause of vision loss that awijaya Un disproportionately affects Asians and women. Risk factors for open-angles as Brawline awijaya awijaya Universitas Brawı glaucoma include increased age, family history, African ethnicity, increased awijaya awijaya intraocular pressure, decreased corneal thickness and myopia. However, risk awijaya In factors for angle closure glaucoma include Inuit and Asian ethnicity, female sex, it as Brawi awijaya awijaya hyperopia, small corneal diameter, shallow anterior chamber, short axial length, steep corneal curvature, shallow limbal chamber depth, and thick, relatively as Brawlaya anteriorly positioned lens (Singh, 2004). Universitas Brawijaya awijaya

awijaya awijaya 2.2.4 Diagnosis UnivA. Structural Changesniversitas Brawijaya Universitas Brawijaya awijaya Cross-section demonstrates the optic nerve head (optic disc) has a central itas Brawijaya awijaya depression where the retinal vessels enter the eye. It is known as the 'cup'. When awijaya awijaya peripheral nerve fibres are lost in glaucoma, the remaining fibres take their places awijaya un and leave a larger 'cup'. There is a progressive 'cupping' of the optic nerve head it as Braw awijaya awijaya when progressive axonal loss. This is the end result of fully cupped disc is the disc awijaya awiiava with cavernous optic atrophy. Cupping of the optic disc may be seen on awijaya Uni fundoscopy. It shows as an area of central pallor. The ratio of the cup size to the itas Brai awijaya awiiava disc size demonstrated the degree of cupping. The degree of some cupping is awijaya awiiava normal and some have physiologically enlarged cups. Therefore, cupping is awijaya suspicious if the cup/disc ratio is more than 0.5, the vertical cup/disc ratio is more awijava awijaya than the horizontal cup/disc ratio and there is asymmetry between the cup/disc awijaya Uni ratios of the two eyes of more than 0.2 (Williams S, 2007). awijaya awijaya awijaya <sup>er</sup> Colour photography, stereoscopic photography, optical coherence tomography<sup>st as braw</sup> awijava (OCT), and confocal scanning laser ophthalmoscopy (Heidelberg Retina awijava awijaya Tomograph or HRT) can be used for objective assessments. These last two can awijaya awijava also be used to evaluate the thickness of the retinal nerve fibre layer (RNFL) that the braw awijaya surrounds the optic disc. The thinning of the peripapillary retinal nerve fibre layer awijaya awijaya (RNFL) is a sensitive indicator of glaucomatous axonal loss. Scanning laser awijaya awijaya polarimetry (Nerve Fiber Analyser or GDx VCC) can be used to assess this. However, the diagnosis of glaucoma cannot be made on solely based on structural changes alone. Thus, diagnosis tests demonstrating functional changes are also Univergative the tructural changes to diagnose glaucoma (Williams S, 2007). Instead Brawn

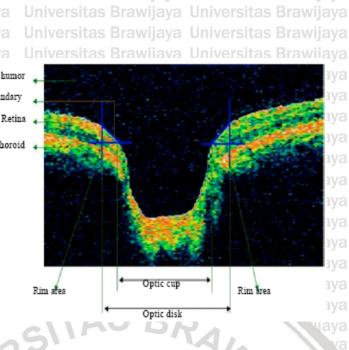
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Figure 2.1 OCT of the optic nerve head showing the cup (Ganesh B, 2012).

### **B.** Functional Changes

awijaya The axonal loss begins with axons in the periphery of the nerve. These axons awijaya Unioriginate in the retinal ganglion cells in the retinal mid-periphery with consequent it as Brawijava awijaya awijaya visual field fallout in these regions. The scotomas that develop in the visual field awijaya awijaya Univoften go unnoticed by patients. Formal automated perimetry (visual field testing) issuas Brawijaya awijaya used to detect these scotomas. In formal automated perimetry, the patient is awijaya awijaya presented with targets of differing intensity at different points within their visual awijaya Uni field. A best way to assess the visual field is to look at the grey-scale representationsitas Brawijaya awijaya awijaya of the field. The normal visual field is called a 'hill' of vision with the best acuity at awijaya awijaya fixation tailing out to the periphery. The 'blind spot' refers to the optic nerve head. awijaya Universitas Brawijaya Uni It is located at about 15 degrees temporal to the fixation point (Williams S, 2007). sitas Brawijaya awijaya awijaya Univer There is initially an enlargement of the blind spot followed by mid-peripheral itas Brawijaya Unit 'arcuate' scotomas in glaucoma. In end-stage glaucoma, the patients have tunnels tas Brawijava vision when all but the central area of fixation is involved. At this stage, the patient Unimay still have a normal visual acuity when tested on a Snellen chart although theresitas Brawlaya

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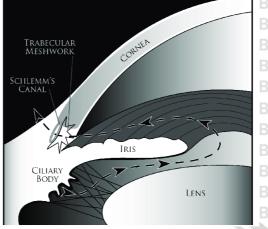
is enormous fallout of visual field. However, this type of testing has limitations because it is subjective, requires concentrations and does not detect early In damage. Thus, tests such as short wavelength automated perimetry (SWAP), it as Brawi awijaya frequency doubling technology (FDT) and multifocal visual evoked potentials awijaya awijaya Uni (mVEP) should be used iversitas Brawijaya Universitas Brawijaya awijaya Universita C. Intraocular Pressure (IOP) awijaya awijaya awijaya Tonometry is used to measure the pressure within the eye. Firstly, eye drops awijaya awiiava are used to numb the eye (anesthetic). Then, a device called a tonometer is used awijaya awijaya Uni to measure the inner pressure of the eye. A small amount of pressure is applied to it as Braw awijaya the eye by a tiny device. The range for normal pressure is 12-22 mmHg. Most of awijaya awijaya the glaucoma cases show pressure that exceeds 20mmHg. However, there are awijaya Un some people can have glaucoma at pressures between 12-22mmHg (Glaucoma awijava awijaya Research Foundation, 2017). Intraocular pressure (IOP) is determined by aqueous awijaya awijaya Unhumour production and outflow. Ciliary body produces aqueous humour. Aqueous Itas Brawl awijaya humor flows over the lens into the anterior chamber of the eye. The trabecular awijaya awijaya meshwork lies circumferentially in the angle of the eye. 90% of aqueous humor awijava awijaya Uniexits the eye through trabecular meshwork into the canal of Schlemm. The canal it as Braw awijaya of Schlemm connects to the episcleral venous circulation through aqueous veins. awijaya awijaya The remaining aqueous exits the eye directly via uveoscleral outflow. Aqueous awijaya production is usually constant. Therefore, a raised IOP is the result of increased it as Brawn awijaya awijaya resistance to outflow at the trabecular meshwork level (Williams S, 2007) awijaya

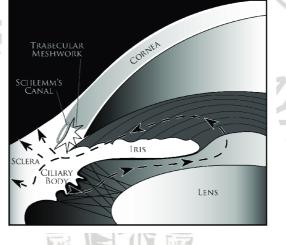
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Univ Figure 2.2 The drainage angle - aqueous humor dynamics (Goel M, 2010). Isitas Brawijaya Universita

2.3 Relationship between Fasting Glucose, Metabolic Syndrome and

awijaya Uni Glaucoma

awijaya Universitas Braw,

Studies were conducted in order to determine if elevated fasting blood glucose level that is a parameter of metabolic syndrome has positive associations with increased intraocular pressure (IOP) and glaucoma. However, the mechanisms relating fasting blood glucose level to increased IOP are unclear. Increased

intraocular pressure (IOP) in metabolic syndrome may be the result of hyperglycemia, which in turn may induce an osmotic gradient that draws excess

aya Universitas Brawijaya awijaya awijaya aqueous humor into the anterior chamber and to autonomic dysfunction. Moreover, awijaya hyperglycemia also may increase IOP by interrupting the trabecular meshwork it as Brawijaya In function. Nonetheless, the association between diabetes and IOP was weak, it as Brawijava awijaya suggesting that the association between diabetes and glaucoma in part may be awijaya awijaya independent of raised IOP (Di Zhao et al., 2015). Thus, further researches are awijaya needed to study the relationship between fasting blood glucose, metabolic awijaya awijaya syndrome and glaucoma. awijaya awijaya 2.4 Relationship between Blood Pressure and Glaucoma awiiava awijaya awijaya Studies have suggested possible mechanisms for the association between the Brawlaya awijaya cardiovascular risk factors and elevated IOP. In particular, hypertension is linked awijaya awijaya to an elevated IOP in a physiological manner; SBP, rather than DBP, elevates IOP awijaya awijaya Uni because peaks of SBP that reach the eye can lead to ultrafiltration. However, othersitas Brawijaya awijaya studies have implied that ocular perfusion pressure seems more pertinent to awijaya awijaya Uninglaucoma than BP alone, and relationship of BP and OAG may be affected by Sitas Brawijaya awijaya Univmany complex factors. Therefore, further studies are needed to confirm thesitas Brawijava awijaya awijaya relationship between blood pressure and glaucoma. awijaya awijaya awijaya awijaya

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awijaya awijaya awijaya CHAPTER 3 awijaya Universitas Bray CONCEPTUAL FRAMEWORK AND HYPOTHESIS java awijaya awijaya awijaya awijaya 3.1 Conceptual Framework awijaya Universitas Brawijaya awijaya awijaya Metabolic Syndrome awijaya awijaya awijaya awijaya awijaya awijaya awijaya Fasting Blood Blood Pressure: awijaya **Glucose Level** Systolic & awijaya (FBG) Diastolic awijaya awijaya awijaya Iniversitas Brawijaya awijaya ersitas Brawijaya awijaya Systolic: **Diastolic:**  $\geq 100 \text{ mg/dL}$ awijaya <u>> 130 mmHg</u> <u>></u> 85 mmHg awijaya awijaya Universita **Universitas Brawijaya** awijaya awijaya **Universitas** awijaya <del>ersitas</del> Brawijaya awijaya iversitas Brawijaya awijaya awijaya Normal-Tension awijaya Glaucoma (NTG) s Brawijaya awijaya s Brawijaya awijaya Universitas as Brawijava awijaya

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awijaya awijaya awijaya awijaya awijaya awijaya 3.2 Hypothesis awijaya Uni Increased level of fasting glucose and high blood pressure increases the risk ofsitas Brawijaya awijaya developing normal-tension glaucoma. awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya AVERS awijaya awijaya

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4.5

awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya Universitas Brawijava awijaya awijaya awijaya awijaya awiiava awijaya n = minimum number of samples needed awijaya awijaya awijaya awijaya awijaya

CHAPTER 4 UniverRESEARCH METHODersitas Brawijava 4.1 Research Design

The study design used is observational study with cross-sectional approach. The purpose was to determine the relationship between metabolic components it as Brawijaya (fasting blood glucose level and blood pressure) and normal-tension glaucoma.

### 4.2 Locations and Period of Research

ersitas Brawijaya This research was be conducted at Outpatient Clinic for Internal Medicine and Outpatient Clinic of Ophthalmology in Saiful Anwar Hospital from December 2017

 $n = \frac{Z_{\alpha}^2 p q}{d^2} = \frac{Z^2 p (1-p)}{d^2}$ 

to March 2018.

### Uni 4.2.1 Sample Size Estimation

The number of samples was determined by Lemeshow Formula:

UnivInformation:

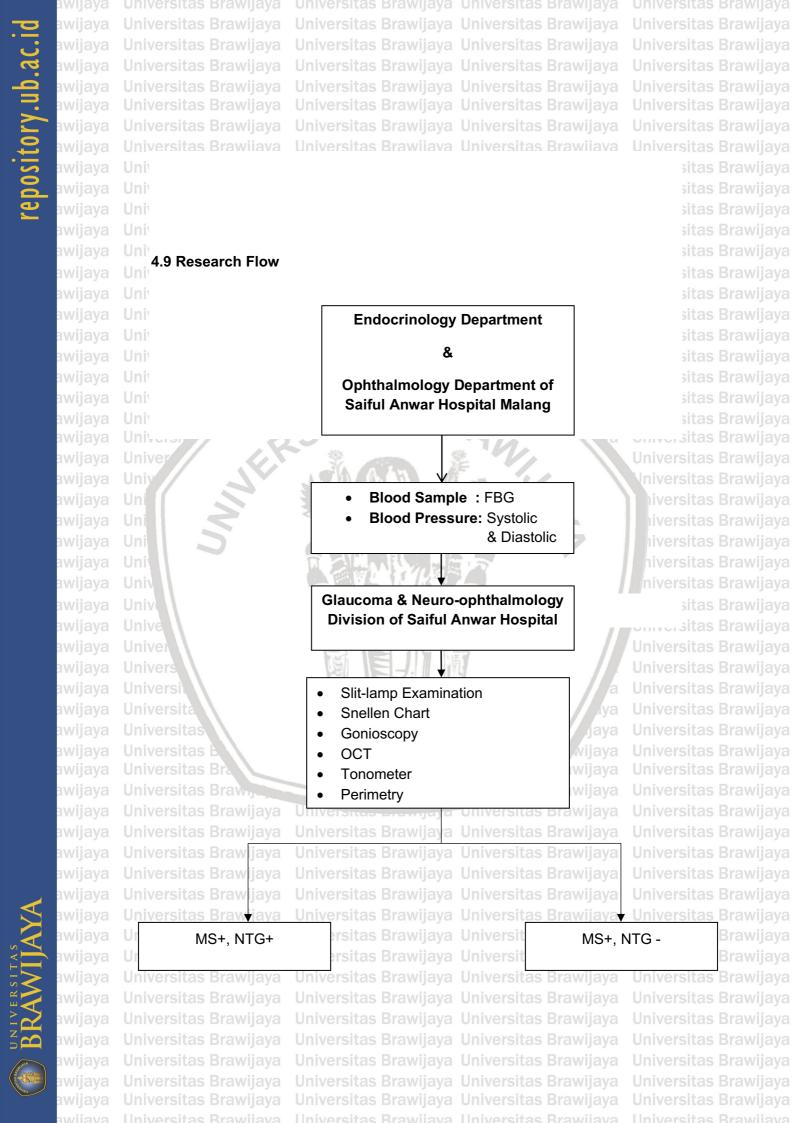
Z = degree of trust (1.64 for  $\alpha$  = 0.1) P = proportion of people with optic neuropathy (6%) Uning = proportion of people who are not sufferers of optic neuropathy java

d = limit of error or absolute precision ( $\alpha = 0.1$ ) Uni From the calculation results, the minimum sample size is 15.17 or rounded up to itas Brawijaya 15 patients. awijaya awijaya awijaya awijaya 4.3 Sample Selection awijaya The sample of this research was taken consequently from patients in Outpatient awijaya awijaya awijaya Clinic of Endocrinology and Ophthalmology in Saiful Anwar Hospital. Their fasting awiiava glucose levels and blood pressure were measured. They were later sent to the awijaya awijaya Glaucoma and Neuro-ophthalmology Department to test for normal-tension awijaya awijaya glaucoma (NTG). They were later subdivided into two groups: awijaya awijaya I. With normal-tension glaucoma awijaya Without normal-tension glaucoma П. awijaya awijaya awijaya awijaya 4.4 Inclusion and Exclusion Criteria awijaya awijaya **Inclusion Criteria** awijava awijaya Age > 40 years old. awijaya awijaya Fulfill the diagnostic criteria of Metabolic Syndrome based on IDF: awijaya awijaya Universita Central obesity (abdominal circumference> 90 cm for Asian men and tas Brawijaya awijaya abdominal circumference> 80 cm for Asian women) plus 2 of the following awijaya Universita 4 factors: 4 awijaya awijaya ersita (1) Triglycerides> 150 mg / dL (1.7 mmol / L ) or being treated for it as Brawijava hypertriglyceridemia;

(2) HDL-C: <40 mg / dL (1.03 mmol / L) in men and <50 mg / dL (1.29 Universita mmol / L) in women or under treatment for elevated HDL-C levels; Universita (3) Blood pressure: systolic> 130 mmHg or diastolic> 85 mmHg or tas Brawijava awijaya moderate in the treatment of hypertension; awijaya awijaya Universita (4) Fasting blood sugar (FBG)> 100 mg / dL (5.6 mmol / L), or type 2.14 itas Brawijaya awijaya diabetes. awijaya Patients are willing to be taken blood for measuring fasting blood glucose. awijaya awijaya awijaya Universeta Willing to give approval as a research sample. awiiava There are no systemic complications from metabolic syndrome. awijaya awijaya awijaya awijaya **Exclusion Criteria** awijaya awijaya Presence of other optic neuropathy other than glaucoma. awijaya The results of diagnostic investigations are incomplete. awijaya awijaya The patient refused to take part in the research as a sample. awijaya awijaya 4.5 Variables awijaya awijaya 4.5.1 Independent Variable awijaya awijaya The independent variable of this research is fasting glucose level and blood tas Brawijava awijaya awijaya pressure. awijaya awijaya 4.5.2 Dependent Variable ersitas Brawijaya Universitas Brawijaya awijaya awijaya Uni The dependent variable of this research is occurrence of normal-tension glaucomasitas Brawijaya awijaya awijaya among the metabolic syndrome patients. Java Universitas Brawijaya

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	awijaya	Universita Metabolic syndrome: is a collection of risk factors based on the components	sitas Brawijaya
	awijaya	Universitas Brz Sawijava Univer	sitas Brawijaya
	awijaya	Universita and criteria of the IDF (International Diabetes Federation) in 2006, namely	sitas Brawijaya
	awijaya	Universit Central obesity (as measured by abdominal circumference whose norma	sitas Brawijaya
	awijaya	Univer	sitas Brawijaya
	awijaya	Univ values are based on specific ethnicity), added by at least 2 of the following	sitas Brawijaya
	awijaya	Uni Vier Vier Vier Vier	sitas Brawijaya
	awijaya	Uni 4 factors :	sitas Brawijaya
	awijaya	Uni I. Increase in triglycerides: ≥ 150 mg / dL (or therapy for dyslipidemia)	sitas Brawijaya
	awijaya	Unit	sitas Brawijaya
	awijaya	University II. Decrease in cholesterol HDL: <40 mg / dL (male) or <50 mg / dL	sitas Brawijaya
	awijaya awiiava	Univer	
	awijaya	Univer (female) (or get therapy for dyslipidemia).	sitas Brawijaya
	awijaya awijaya	Univ Univer (female) (or get therapy for dyslipidemia).	rsitas Brawijaya rsitas Brawijaya
	awijaya awijaya awijaya	<ul> <li>(female) (or get therapy for dyslipidemia).</li> <li>III. Increase in blood pressure: systole ≥ 130 or diastole ≥85 mmHg (or get therapy for dyslipidemia).</li> </ul>	rsitas Brawijaya rsitas Brawijaya rsitas Brawijaya
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BRAWIJAYA	awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya	University       (female) (or get therapy for dyslipidemia).         University       III.       Increase in blood pressure: systole ≥ 130 or diastole ≥85 mmHg (or therapy for hypertension).         University       IV.       Increased fasting blood sugar: ≥ 100 mg / dL.         University       IV.       Increased fasting blood sugar: ≥ 100 mg / dL.         University       In this study, the component of the metabolic syndrome used was ar         University       Increase in fasting blood sugar levels.         University       Increase in fasting blood sugar levels.         University       Increase and Materials         University       Snellen chart         University       II.         Application tonometer (Haag streit AT 900 scale value 1.96 mN CE         0124)       Oniversity         University       III.         Direct fundoscopy (Neitz Halogen Ophthalmoscope BX α)         University       III.         Direct fundoscopy (Neitz Halogen Ophthalmoscope BX α)         University       III.         Direct fundoscopy (Neitz Halogen Ophthalmoscope BX α)         University       III.         University       III.         University       III.         Direct fundoscopy (Neitz Halogen Ophthalmoscope BX α)         University       IIII	rsitas Brawijaya rsitas Brawijaya
BRAWIJAYA	awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya	Universitation       (female) (or get therapy for dyslipidemia).         Universitation       III.       Increase in blood pressure: systole ≥ 130 or diastole ≥85 mmHg (or therapy for hypertension).         Universitation       IV.       Increased fasting blood sugar: ≥ 100 mg / dL.         Universitation       Increase in fasting blood sugar: ≥ 100 mg / dL.         Universitation       Increase in fasting blood sugar levels.         Universitation       Inversitation         Universitation       Snellen chart         Universitation       Increase         Univers	rsitas Brawijaya rsitas Brawijaya

epository.ub.ac.id awijaya awijaya Gonioscopy Thorpe 4 Universitas<sup>I</sup>B awijaya Universitas P Slitlamp OCT (OCT Cirrus HD-5000) awijaya Universitas 4 Universitas B VII awijaya Humphrey Perimetry (Carl Zeiss Meditec HFA II 750-31257-5.1,1) **Universitas B** awijaya awijaya Universita**∀**∎ Disposable syringes awijaya IX. Blood vacutainer tubes awijaya awijaya awijaya awijaya 4.7 Research Procedures awiiava awijaya The research was conducted by collecting blood samples and measuringsitas Brawijaya awijaya awijaya the fasting blood glucose and blood pressure. The blood sample were taken after awijaya awijaya an overnight fast. A fasting blood sugar level less than 100 mg/dL (5.6 mmol/L) issitas Brawijaya awijaya normal. A fasting blood sugar level from 100 to 125 mg/dL (5.6 to 6.9 mmol/L) is trans Brawijaya awijaya awijaya considered prediabetes. If it's 126 mg/dL (7 mmol/L) or higher on two separate awijaya University, you have diabetes. Then, the patients were checked if they have glaucomasitas Brawijaya awijaya awijaya by measuring IOP with the help with tonometer, fundoscopy and OCT. The blood awijaya pressure of the patients were measured. Patients with systolic blood pressure ≥sitas Brawijaya awijaya awijaya Univ130mmHg or diastolic blood pressure ≥85 mmHg were checked if they have NTG.sitas Brawijava awijaya awijaya awijaya Univ4.8 Data Collection and Statistical Analysis awijaya awijaya Samples were collected by purposive random sampling. Normality test awijaya awijaya Univused is the Kolmogorov Smirnov test. Bivariate analysis was used to see the iversitias Brawijaya awijaya relationship between Systolic BP and FBG with NTG by using a statistical test, ersitas Brawijaya awijaya RAWIJAYA Spearman Correlation Test with the SPSS 21.00 program for windows. awijaya



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awijaya Universitas Brawijaya Universitas Brawijaya awijaya CHAPTER 5 Universitas Brawij RESEARCH RESULTS AND DATA ANALYSIS vijava awijaya awijaya This chapter discusses the results of research and data analysis on the inversitas Brawijaya awijaya awijaya relationship between blood pressure and fasting blood glucose level with NTG. awijaya Uni This research was conducted at Saiful Anwar Hospital Malang to calculate blood sitas Brawijaya awijaya awijaya pressure and fasting blood glucose with NTG. The research was conducted he RANIJA awijaya awiiava between December 2017- March 2018. awijaya awijaya awijaya awijaya 5.1 Univariate Analysis awijaya awijaya Uni The following is an explanation of the results of the univariate analysis which iversitas Brawijaya awijaya awijaya includes respondents' demographic data. awijaya awijaya Uni 5.1.1 Demographic data awijaya awijaya awijaya Patient demographic data were obtained by age, sex. awijava . Table 5.1 Frequency distribution of Patient demographic data at Saiful Anwar awijaya awijaya Universitas Brawijaya awijaya Hospital. awijaya awijaya Gender MS % MS+NTG % awijaya 9 Female 60.00 53.33 8 awijaya 7 Male 6 40.00 46.67 awijaya awijaya Un Based on table 5.1, it can be seen that patients with female sex with MS were 9 rsitas Brawijaya patients (60%) and those with MS + NTG were 8 patients (53.33%). Whereas awijaya

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awijaya						Universitas	
awijaya	Universitas Brawijaya		tas Brawijaya			Universitas	
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awijaya	patients with male se						
awijaya	were 7 patients (46.6	67%).	tas Brawijaya	Universitas	Brawijaya	Universitas	
awijaya	Universitas Brawijaya					Universitas	
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awijaya	Universitas Brawijaya	Universit	tas Brawijaya	Universitas	Brawijaya	Universitas	
awijaya	Universitas Table 5.2 P	allent Dest	inpuve Staustic:	s at Saliul Any	war nospitai	Universitas	5 5
awijaya	Universitas Brawijaya	Universit		95%	CI for Mear	Universitas	
awijaya	UniversiParameterijaya	Group	Mean $\pm$ sd		and Upper	Bound	Brawijaya
awijaya	Univ <del>ersitas Brawijaya</del> Age	MS	$49.60 \pm 6.82$	45.82	53.	38	Brawijaya
awijaya	Universitas Brawu	MS+NTG	$61.07 \pm 9.26$	55.94	Brawijava 66.	20	Brawijaya
awijaya	Universitas Brazilia	MS	$132.33 \pm 14.23$				Brawijaya
awijaya	UIIIVEISILAS	MS+NTG	$132.00 \pm 13.50$		137	.23 .47	Brawijaya
awijaya	University	MS	$\frac{130.00 \pm 13.30}{85.33 \pm 11.87}$		91	. <u>47nive</u> rsitas	Brawijaya
awijaya	Children (	MS+NTG	$81.00 \pm 7.61$	76.79	85	91 <sub>Jnive</sub> rsitas 21 <sub>Inive</sub> rsitas	Drawijaya
awijaya		MS	$113.47 \pm 30.49$		130	.35 iversitas	Browijaya
awijaya		MS+NTG	$99.07 \pm 15.07$		107	. <u>41 live</u> rsitas	Brawijaya
awijaya awijaya	Uni	INIS + IVI S	<u></u>	90.12			Brawijaya
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awijaya	5.2 Normality Test		STELLA			Universitas	
awijaya	Univer	E2)	EZES		/	Universitas	
awijaya	This test is conducte	d to determ	nine whether the	e residual valu	ie is spread	normally	Brawijaya
awijaya	University of not. The test proc	1000		2.H			
awijaya	Universita	edure is ca	rried out by the	Kolmogorov-a	Smirnov test	Universitas	Brawijava
awijaya	Uni following conditions:		AA		jaya	Universitas	
awijaya	Universitas B				wijaya	Universitas	
awijaya	The hypothesis used	4.			awijaya	Universitas	Brawijaya
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awijaya	H0: Data is spread n	Universit	as brannjaya	universitas	Brawijaya	Universitas	Brawijaya
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awijaya	Universitas Brawijaya	Universit	tas Brawijaya	Universitas	Brawijaya	Universitas	
awijaya	Uni H1: Data is not sprea	ad normally	as Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya
awijaya	Universitas Brawijaya					Universitas	
awijaya	Uni If the value of sig. (p						
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awijaya 	normality is fulfilled.		tas Brawijaya			Universitas	
awijaya	Universitas Brawijaya		tas Brawijaya			Universitas	
awijaya	Uni The results of the no	•				Universitas	
awijaya	Universitas Brawijaya		tas Brawijaya			Universitas	
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Table 5.3: Normality Test Results

	Shapiro-Wilk					
	Statistic	df	Sig.	ijaya		
Systolic BP	.946	30	.134	ijaya		
Diastolic BP	.800	30	.000	ijaya		
FBG	.783	30	.000	ijaya		

Universitas Brawijaya Source: Primary data processed versitas Brawijaya

From the results above, sig. Systolic BP is 0.134 (can be seen in Table 5.4) or greater tas Brawlaya

Uni than 0.05; then the provisions of Ho are accepted, that the assumption of normality in a Brawie was

is fulfilled. But for Diastolic BP and FBG sig. smaller than 0.05. So, for Diastolic BP stas Brawlaya and FBG, statistical measurements using parametric statistics with the Mann Mann

Whitney test is used.

### 5.2.1 Testing the Difference between MS and MS + NTG

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Uni To know the difference between MS and NTG, the statistical tool for the averages tas Brawijava awijaya awijaya

difference test, which is the unpaired t-test is used, because it is assumed that MS

and NTG are mutually independent (not affecting each other).

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Calculation of the unpaired t-test using the help of SPSS software version 20.00, so awijaya

the results obtained in Table 5.4 below:

awijaya Universitas ETable 5.4a Universitas Brawijava awijaya Independent T-test awijaya Parameter NTG N Mean Std. Deviation awijaya

Universitas Brawijaya

Urpiversitas Brawijaya

/a	Universitas Brawijava	Universitas	Brawnaya	ordi Dernaria	Brawliava	Universitas	Brawijaya
/a	UniverSystolic BPwijaya	AS <sub>Inivers</sub> 15 <sub>is</sub>	132.333	Uni 14.251	Bra0.460 <sup>a</sup>		Brawijaya
/a	Universitas BrawijaMS-	+NTG <sub>vers</sub> 15 <sub>is</sub>	130.000	Uni 13.496 s	Brawijaya	<u>Universitas</u>	
/a	Unive Diastolic BPvijava	ASInivers15is	B 85.333	Uni 11.872 S	Brawijava	0.316	
/a	Universitas Brawija MS-	+NTGvers15	B 81.000	Univ7.606as	Brawijaya	Universitas	
/a	Universit <b>F</b> BG rawijaya	ASInivers15is	B 113.467	Uni 30.486 s	Bra 0.460	Universitas 0.191	Brawijaya
/a	Universitas BrawijaMS-	+NTGvers15is	Br 99.067a	Uni 15.069 s	Brawijaya	Universitas	Brawijaya
/a	Universitas Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya
/a	Universitas Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya
/a	Universitas Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya
/a	Universitas Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya
/a	Universitas Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya
	Universitas Brawijava	Universitas	<b>R</b> rawiiava	Universitas	<b>Brawijava</b>	Universitas	<b>Brawijava</b>

awijaya awijaya awijaya Based on the Table 5.4, t-test results obtained t-test results for Systolic BP of 0.460 Brawijaya and p value of 0.649 and because the value of p (0.649)>  $\alpha$  = 5%, then H0 is the Brawijava awijaya awijaya accepted. So, it can be concluded that there are insignificant differences between awijaya awijaya MS and MS + NTG. awijaya awijaya Mann Whitney test calculations using the help of SPSS software version 20.00 tas Brawijaya awijaya Unjobtained results as shown in the following Table 5.5: awijaya awijaya BRAW RSTAS B Table 5.5 awiiava awijaya awijaya

	Mann	Whitney Tes	st		
TG	N	Mean	Std. Deviation	t	pversit
/IS	15	85.333	11.872	0.460	
NTG	15	81.000	7.606	0.460	0.316rsit
1S	15	113.467	30.486	0.460	0.191 rsit
NTG	15	99.067	15.069	0.460	0.191/SI
- ſ	NTG	NTG 15	NTG 15 99.067	NTG 15 99.067 15.069	NTG 15 99.067 15.069

awijaya Based on the Table 5.5, Mann Whitney test results obtained for Diastolic BP is ersitas Brawijaya awijaya with a p value of 0.316 and because the value of p (0.316)>  $\alpha$  = 5%, then H0 is gravitated as Brawijaya awijaya

accepted. So, it can be concluded that there are insignificant differences between

awijaya Un MS and MS + NTG.

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can be concluded that there are insignificant differences between MS and MS + Universitas Brawijaya

Based on the Table 5.5, the Mann Whitney test results for FBG is with a p value

Uni of 0.191 and because the value of p (0.191)>  $\alpha$  = 5%, then H0 is accepted. So, it sitas Brawijaya

5.3 Correlation Analysis Uni Bivariate analysis was used to see the relationship between Systolic BP and FBGsitas Brawijaya with NTG by using a statistical test, Spearman Correlation Test with the SPSS awijaya awijaya Uni 21.00 program for windows rsitas Brawijaya Universitas Brawijaya awijaya Spearman's correlation is used in analyzing the relationship between the two awijaya awijaya awijaya Univariables. In this study there are two sources of data, namely variable X and iversitas Brawijaya awijaya variable Y. awijaya awijaya Uni In the correlation test, there are two hypotheses that can be used: awijaya awijaya Uni 1. H0: there is an insignificant relationship (correlation) between Variable X and ersitas Brawijaya awijaya awijaya Un Variable Y awijaya awijaya 2. H1: There is a significant correlation (correlation) between Variable X and versitas Brawijaya awijaya awijaya Variable Y awijaya awijaya Table 5.6 awijaya awijaya awijaya **Correlation Guideline** awijaya Coefficient interval **Relationship Level** awijaya 0,00 - 0,199Very Low awijaya 0,20 - 0,399awijaya Low awijaya 0,40 - 0,599Moderate awijaya 0,60 - 0,799Strong awijaya 0,80 - 1,000U Very Strong awijaya awijaya Universitas Brawij awijaya Uni The results of the correlation test between the variables, Systolic BP and FBG with it as Brawijava NTG using the Spearman correlation are shown in Table 5.7.

awijaya Table 5.7 awijaya Universitian Brawing Correlation of Systolic BP and FBG with NTG Universitas BraVariable Relationship Brawijayar Spearman as Brawp-value Universitas Bra Systolic BP - NTGas Brawijava -0,186awijaya Brawi0.326 Universitas BrawijaFBG - NTG -0.243 0.196 awijaya awijaya awiiava awijaya Unia. Correlation between Systolic BP and NTG awijaya awijaya awijaya From the results in Table 5.7, it can be seen that the value of the Spearman Itas Brawijaya awiiava Uni correlation coefficient is negative, that is -0.186. Negative direction means that it as Brawn awijaya awijaya when the Systolic BP variable increases, the patient who tends to have NTG awijaya awijaya decreases. The resulting correlation coefficient shows the magnitude of the tas Brawlaya awijaya relationship of 0.186. This correlation value indicates that the relationship between awijaya awijava Systolic BP and NTG variables is in the very low category. Based on the test results awijaya awijaya Univabove, it can be seen that the p-value is greater than alpha 5% (0.326> 0.05), so it as Brawijava awijaya H0 is accepted with the conclusion that there is a correlation between Systolic BP awijaya awijaya and NTG which is not significant. awijaya awijava awijaya awijaya b. Correlation between FBG and NTG awijaya awijaya awijaya From the results in Table 5.7, it can be seen that the Spearman correlation as Brawlava awijaya coefficient is negative, that is -0.243. Negative direction means when the FBG awijaya awijaya variable increases, then the patient who tends to have NTG decreases. The Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Universality correlation coefficient shows the magnitude of the relationship of 0.243. It as Braw

This correlation value indicates that the relationship between the FBG variable and

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awijaya awijaya awijaya the p-value is greater than alpha 5% (0.196> 0.05), so that H0 is accepted with the awijaya conclusion that there is a correlation between FBG with NTG which is not Univsignificant.rawijava awijaya awijaya awijaya awijaya awijaya awijaya

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awijaya CHAPTER 6 awijaya Universita DISCUSSION Universitas Brawijava awijaya awijaya The aim of this research is to investigate the relationship between metabolic awijaya awijaya Unicomponents (blood pressure and fasting blood glucose) and normal-tension it as Brawijava awijaya awijaya glaucoma. The sample of this research was taken consequently from patients in awijaya awijaya Ophthalmology Department and Endocrinology Departments of Saiful Anwar awiiava Uni Hospital Malang who were diagnosed with metabolic syndrome. Their fasting it as Brawijava awijaya awijaya glucose levels and blood pressure were measured. They were later sent to the awijaya awijaya Glaucoma and Neuro-ophthalmology Division to test for normal-tension glaucoma. Stas Brawlaya awijaya awijaya awijaya awijaya 6.1 Fasting Blood Glucose (FBG) and Normal-Tension Glaucoma (NTG) awijaya awijaya awijaya This study has demonstrated that fasting blood glucose level (FBG), which is awijaya awijaya one of the components of metabolic syndrome, has no significant effect on the awijaya awijaya Un occurrence of normal-tension glaucoma (NTG). Subjects with metabolic it as Brawijava awijaya component, in this case fasting blood glucose level (FBG) > 100mg/dL, has the awijaya awijaya same probability of getting NTG as those with normal FBG. awijaya awijaya The results of current study correspond well with some earlier studies, where awijaya awijaya the history of diabetes mellitus (DM) appeared to be significantly protective against it as Brawijaya awijaya developing glaucoma (Gordon et al., 2002). In another population-based study, the Brawiava

association between diabetes mellitus and glaucoma was also unclear (Tielsch et Universitas Brawiava Universitas Brawiava Universitas Brawiava Universitas Brawiava Universitas

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al., 1995). One of the previous longitudinal study also do not confirm diabetes mellitus or fasting blood glucose as a risk factor for the incidence of glaucoma. However, some other studies have found significant association between fasting awijaya awijaya blood glucose and normal-tension glaucoma. In a previous study which awijaya investigated the association between impaired glucose tolerance (IGT) and awiiava awijaya normal-tension glaucoma (NTG), demonstrated that high IGT was associated with awijaya Uni an increased prevalence of NTG. Those subjects in that study with higher IGT had it as awijaya awijaya an higher odds ratio for developing NTG. Also, some other earlier studies awiiava awijaya demonstrated that diabetes mellitus increases the risk of developing open angle awijaya glaucoma (Newman-Casey et al., 2011; Bonovas et al., 2004; Nakamura et al., awijava awijaya 2005; Chopra et al., 2008; Klein et al., 1994; Pasquale & Kang, 2009). awiiava awijaya It is also reasonable to suggest that diabetes has an association with glaucoma awijava awijaya because impaired autoregulation is assumed to play an important role in the awijaya Uni development of glaucoma (Suh et al., 2009; Flammer et al., 2002; Grieshaber & itas Braw awijaya awijaya Flammer, 2005). Another study by Barbara (1994) concluded that the presence of awijaya awijaya open angle glaucoma is increased in older-onset diabetes. Moreover, in a study awijava that investigated the prevalence of glaucoma and type 1 and type 2 diabetes, it awijaya awijaya was concluded that neurovascular glaucoma has a positive correlation with awijaya diabetic microvascular complications (Nielsen N.V. et al., 1983). In addition to that, awijaya high levels of blood glucose and newly diagnosed diabetes mellitus are proven to awijaya awijaya have an association with elevated intraocular pressure (IOP) and high-tension Uniglaucoma (Dielemans I. et al., 1996). awijaya Universitas Brawijaya In another analysis, components of metabolic syndrome especially elevated In FBG caused higher IOP levels than subjects with normal FBG and consequently it as Brawn

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awijaya awijaya cause glaucoma. Although the exact mechanism underlying this association is unclear, it is assumed that hyperglycemia increases production of fibronectin in the trabecular meshwork which may increase the resistance to aqueous humour flow tras Braw awijaya and hence leads to an elevated IOP. Moreover, hyperglycemia is believed to cause awijaya awijaya apoptosis in retinal neuronal cells via the hexosamine biosynthetic pathway. The stars Braw awijaya study also suggested that oxidative stress induced by hyperglycemia and end awijaya awijaya products of advanced glycation may increase death of retinal neurons by apoptosis awijaya Uni (Rasoulinejad S.A. et al., 2015). awijaya awiiava awijaya It has also been demonstrated in studies that diabetes mellitus is associated awijaya awijaya with primary open angle glaucoma (POAG). There is evidence that shows that the awijaya presence of long-standing elevated FBG alongside dyslipidemia increases the risk awijaya awijaya of neuronal injury from stress (Kong G.Y. et al., 2009; Fan N. et al., 2015). Next, awijava awijaya In some studies suggested that the capacity to auto-regulate blood flow may take awijaya decrease in diabetic eyes and will reduce retinal blood flow. As a result, in order to awijaya awijaya elevated intraocular pressure (IOP), relative hypoxia occurs in diabetic eyes and awijaya causes the levels of hypoxia- inducible factor-1 (HIF-1a) to increase in retinal awijava awijava ganglion cells, and in the optic nerve head of glaucomatous eyes (Arjamaa O. et awijaya awijaya al., 2006). Other than that, there is another theory, suggests that diabetes mellitus as Brawlaya awijaya may exacerbate remodelling of connective tissue. This reduces compliance at awijaya awijaya trabecular meshwork and subsequently increases the IOP and decreases awijaya awijaya compliance of lamina cribrosa which in turn causes higher mechanical stress on awijaya the optic nerve head (Roberts M.D. et al., 2009). Although some previous studies support the findings of the current study, there it as Brawijaya are many other studies that show contradicting results. Therefore, further studies

are needed to be conducted to investigate the relationship between fasting blood alucose and normal-tension glaucoma (NTG) for better understanding. awijaya awijaya 6.2 Blood Pressure and Normal-Tension Glaucoma awijaya awiiava awijaya This study has demonstrated that blood pressure which is one of the awijaya awijaya components of metabolic syndrome, has no significant effect on the occurrence of awijaya awiiava Uninormal-tension glaucoma (NTG). Blood pressure (systolic and diastolic) has notices Brawi awijaya effect on both subjects with or without normal-tension glaucoma (NTG). awijaya awiiava Some studies demonstrated the same results as the current study. For example, it as awijaya awiiava in the Barbados Eye Study, it has been suggested than hypertension plays a awijaya awijava protective role from developing glaucoma. Hypertension maintains an adequate awijaya perfusion for the optic nerve in that study (Leske et al., 2002). There are also awijaya awijaya studies that suggests that diastolic blood pressure has a positive relation to awijaya awijaya Uniglaucoma whereas systolic blood pressure is said to have a negative relation to the Braw awijava glaucoma (Katz & Sommer, 1988). awijava awijaya Univer On the contrary, in a study that investigated whether or not metabolic syndromesitas Brawijava awijaya awijaya is a risk factor for NTG, it was obtained that the prevalence of NTG was greater in awijaya awijaya subjects with hypertension than subjects without hypertension. The correlation was awijaya un even greater when condition of the subjects comorbid with diabetes mellitus (Kimsitas Bra awijaya awijaya M. et al., 2014). A previous longitudinal study suggested the same, in which hypertension increases the chance of developing NTG by 17% and even more (48%) when comorbid conditions like diabetes mellitus and hyperlipidemia exist. There are several theories that explained this. One of the theories suggests that

when the blood pressure increases, the ciliary artery perfusion also increases. This situation increases the risk of glaucoma. Patients with hypertension also are believed to have arteriosclerotic damage and small end vessels stiffening which it as Braw awijaya can cause glaucomatous optic neuropathy. Other than that, it was also predicted awijaya awijaya that the usage of blood pressure lowering drugs can cause decreased perfusion awijaya pressure during episodic systemic hypotension (Newman-Casey et al., 2011). awijaya awijaya Unive In The Shihpai Eye Study conducted in Taiwan, it was found that systolic blood it as awijaya awijaya pressure (SBP) a positive correlation with IOP than diastolic blood pressure(DBP). awiiava awijaya It is because SBP increases aqueous humour production by ultrafiltration and awijaya consequently increases IOP. The SBP plays greater role in this than DBP. This is a Brai awiiava awijaya indicates that the height of pressure wave reaching the eyes plays more important awijaya awijaya role in determining the IOP than perfusion pressure (Lin H. Y. et al., 2005). Many awijava other studies also reported that blood pressure has a strong influence on IOP awijaya awijaya (Memarzadeh F. et al., 2008; Nomura H. et al. 1999; Rochtchina E. et al., 2002; awijaya Un Fukuoka S. et al., 2008). Higher blood pressure elevates IOP by not only awijaya awijaya increasing the pressure of ciliary artery and increasing aqueous humour production awijava awijava but also by increasing sympathetic tone and serum corticoids. Some studies awijaya suggests that more than blood pressure alone, the ocular perfusion pressure is awijaya awijaya more pertinent to development of glaucoma. Thus, suggesting that many other awijaya awijaya complex factors alongside blood pressure affect glaucoma (Choi et al., 2006; Las Brawl awijaya Graham et al., 2013; Bonomi et al., 2000; Leske, 2009; Caprioli & Coleman, 2010). awijaya awijaya Univer As stated above, a small amount of the studies implies the same results as the stas Brawn current study, suggesting that blood pressure has no significant relationship with NTG. However, there are more investigations that show that blood pressure does have an effect on NTG in which elevated blood pressure increases the prevalence

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awijaya awijaya of NTG. Thus, further studies are needed to investigate the relationship between awijaya blood pressure and NTG to get a deeper understanding. Tas Brawijaya awijaya 6.3 Limitations awijaya awijaya There are certain limitations in this research. Although the relationship between awijaya awijaya metabolic components (fasting blood glucose level and blood pressure) and NTG awijaya Unitis demonstrated by analyses, the cross-sectional study design limited the ability to it as Brawijaya awijaya awijaya confirm a causal relationship between these diseases. In addition, the doseawijaya awijaya Universionse relationship between metabolic components (fasting blood glucose and it as Brawijaya awijaya Uni blood pressure) and NTG was not explored by the lack of details regarding severity it as Brawijaya awijaya awijaya

of glaucomatous damage and metabolic syndrome.

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Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **CONCLUSION AND SUGGESTIONS Brawijava** 

Based on the research about relationship between metabolic components

Uni (blood pressure and fasting blood glucose level) and normal-tension glaucoma, sitas Brawijaya can be concluded that:

- There is no significant correlation between blood pressure (BP) and tas Brawijaya incidence of normal-tension glaucoma.
- There is no significant correlation between fasting blood glucose (FBG) and

incidence of normal-tension glaucoma (NTG).

#### 7.2 Suggestions

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Further researches are needed to be done to investigate the relationship awijaya awijaya Uni between metabolic components (blood pressure and fasting blood glucose) and it as Brawijaya awijaya normal-tension glaucoma (NTG) because this research shows no significant Brawijaya awijaya awijaya relationship. Other than that, this study has certain limitations. awijaya awijaya awijaya awijaya awijaya awijaya



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