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Ethiopian athletes` success with altitudinal variations, athlete's distribution and regional states contribution on athlete's production

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Abstract
Different study results suggested that the dominancy of Ethiopian athletes on long and middle distance running related with specific factors of altitude, ethnic group, physiological condition and specific environment. But the reality was different from the above assumption. The objective of this study is to assess Ethiopian athletes` success with altitudinal variations, athletes distribution and regional states contribution on athletes production specifically the success of Ethiopian athletes in relation with motivation to achieve economic success, athletes training and living altitudes, training and competition area effects distance running and the current Ethiopian athletes altitude distribution. The study used mixed methods research designs and convergent Parallel research method. The researcher used questionnaire to collect the data. The demographic distribution related question forwarded to 326 sample athletes. The final result of the study indicated that the current Ethiopian athletes' distribution based on altitude were different and more than eight regional states, Ethiopian athletes were not the same ethnic group and there were no majority group of area or regional state in Ethiopia. Almost all Olympic competition had been held on low altitude that held between 11m and 520 meter above sea level, except Mexico Olympic. All Ethiopian Olympic winners' athletes came from high altitude area above 1600m. The current performance of Ethiopian athletes on athletics sport has been tested to prove by this research work that it is the personal effort of the athletes, not the help of modern training and infrastructure.

Keywords: achievement motivation, altitude, success, acclimatization, economic problem

1. Introduction
1.1 Background
Ethiopia on the Olympic sport participation started since 1956 Olympics. Ethiopian long distance running athletes have been dominating long distance and middle distance running on different types competition those have being pulled in different continental and varies weather condition. Relatively the world long distance running results controlled with east African countries called Ethiopian and Kenyan known as Arisi tribe and Kallenjian tribes. (Onywera *et al*., 2006) [12], (Tam *et al*., 2012) [17], (Hamilton, 2000) [5], (Dr. S. Jayaraman, 2016) [5], (Wilber & Ptsiladis, 2012) [19], (Scott *et al*., 2003) [13]. The researchers said about Ethiopian elite athletes almost all are just came from high altitude area; specifically they came from above 2500 meters above the sea level. But this study result was different from the above assumption that Ethiopian athletes distribution based on location and altitude are different from the above research results. The current study result and distribution of Ethiopian athletes are come from more than eight regional states of Ethiopia and sample locations are presented in the table and graph of at the part of data organization. Based on the data of this research result, Ethiopian athletes were not come from single geographical location or elevation. The Olympic winners of Ethiopian athletes since 1960 got 58 medals and among those 23 were gold, 12 medals were silver and 23 medals were bronze. The athletes birth place were different Ethiopian regional states and altitude that is described on table 3.
The study was investigated that Ethiopian athletes training environment and growing area in related with their long and middle distance running international participation and results. This investigation has shown us what looks like the current Ethiopian athletes training environment and their success.

The previous research results indicated that Ethiopian athletes who were participated in different international and Olympic competition came from specific area, environment, regional state, zones as well as training specific area were similar and this may lead to have false perception about the success of long and middle distance runners in Ethiopia and environmental distribution of the current Ethiopian long and middle distance runners as well as all Ethiopian Olympic medalist since 1960.

1.2 Altitude

The vertical elevation of the land above sea level, altitude is describe an object elevation above a particular reference point and measured from sea level, which is the average level of the sea surface that something is far above sea level. It is the perpendicular distance from the vertex to the base of geometrical figure. (Simonson *et al*., 2015) [14]

Human movements in extremely hostile environments such as sweltering heat of deserts, humid coastal areas and high altitude lead to harmful physiological effects, yet it is unavoidable due to military, sports and tourism activities. Of these harsh climatic adversities, high altitude is one of the most extreme environments posing challenges to human survival and performance. Extremely low temperatures, low humidity and reduced atmospheric pressure are variety of stresses being faced during travel to high altitude. High altitude (above 9000 feet) has decreased atmospheric pressure which decreases the oxygen partial pressure in the air. This means that although the relative percentage of oxygen is unchanged, the number of molecules of O2 present per breathe decreases. (Chawla & Saxena, 2014) [2]. Introduction: High altitude training has become a mainstay in endurance sports, with live high-train low as the current protocol of choice. Athletes either live or sleep in artificial or natural hypoxic conditions with the aim to increase serum erythropoietin concentrations, which are thought to improve maximum oxygen uptake and thus exercise performance.

1.3 High altitude acclimatization

Acclimatization to high altitude is accompanied by increases in haematocrit and hemoglobin concentrations, primarily due to a reduction in plasma volume but also to increased erythropoietin as a result of enhanced erythropoietin release (Strømme & Ingjer, 1994) [15], (Hamilton, 2000) [5], (Moore, 2022) [8]. Acclimatization is cellular adaptation to altitude related problems; it is the physiological and pathophysiological responses to extreme environmental challenges (for example microgravity, hyper-baria, and hypobaric hypoxia of critical illness responses of the human body. (Chawla & Saxena, 2014) [2], (Syed *et al*., 2008) [16], (Simonson *et al*., 2015) [14] (Taylor *et al*., 2016) [18] explained that decreased oxygen availability in the air is the only environmental stress unique to high terrestrial altitudes. It lowers the oxygen supply to body tissues which causes altitude illness, the decline in physical and mental performances, and may aggravate preexisting medical conditions. There is a curvilinear reduction of the barometric pressure with increasing altitude (Chawla & Saxena, 2014) [2] (Murray, 2016) [10], it mean that altitude increased the barometric pressure will be decreased (Naeije *et al*., 2010) [11].

The physiologic significance of decreased barometric pressure is associated with the reduction in the partial pressure of oxygen (hypobaric hypoxia) (Journal & Sciences, 2017) (Murray, 2016) [10]. Although oxygen makes up approximately 21% of the atmosphere at all altitudes, the progressive decrease in partial pressure of oxygen means there is less actual oxygen (i.e., a lower molecular concentration) compared to sea level available for respiration. High altitude training is one of the effective strategies for improving aerobic exercise performance at sea level via altitude acclimatization, thereby improving oxygen transport and/or utilization (Zhang & Chen, 2018) [21], (Derby & deWeber, 2010) [4].

The relationship of decreased oxygen availability (diffusion) to altitude illness and performance decrements provides a classification of altitude exposure based on arterial oxygen content and its physiologic effects. Awareness to acclimatization is very important to sport medicine team to mange altitude related problems and to conduct athletics training at high altitude. High altitude training is one of the effective strategies for improving aerobic exercise performance at sea level via altitude acclimatization (Zhang & Chen, 2018) [21].

1.4 The dominance of ethiopian athletes

The dominance of East-African athletes in distance running remains largely unexplained; proposed reasons include favorable genetic endowment and optimal environmental conditions (Scott *et al*., 2003) [13] Favorable genetic endowment has been proposed as part of the explanation for the success of East African endurance athletes, but no evidence has yet been presented (Moran *et al*., 2004) [9]. Altitude exposure is associated with decreased exercise capacity and increased pulmonary vascular resistance (Naeije *et al*., 2010) [11]. Ethiopian athletes currently dominate long distance running events in Israel. In an attempt to explain the apparently superior running ability of Israeli Ethiopian athletes at distances >5 km, we compared anatomical and physiological measurements in the fastest 21 Israeli Caucasian and 22 Israeli Ethiopian long distance runners with similar mean age, years of training, and weekly volume of training (Wishnizer *et al*., 2013) [20], Elite sporting performance results from the combination of innumerable factors, which interact with one another. Within the field of sports science, elite performance is understood to be the result of both genotypic and phenotypic factors. However, the extent to which champions are born or made is a question yet unsolved.

The present study describes the contributions made by selected physical, training and physiological parameters to the attainment of a high level 10 k performance. The results suggest that factors associated with running cost, independent of body size, play a crucial role in the performance of 10 k running. The results also suggest, though indirectly, that genetic and early life phenotypic factors are more dominant than later-life environmental factors including training (Wishnizer *et al*., 2013) [20].

Endurance running performance of African and non-African athletes is investigated, with better performances seen for Africans (Knechtle *et al*., 2013) [7]. Explanations for the phenomenal success of East African distance runners include unique dietary practices (Beis *et al*., 2011) [1].

The current dominance of African runners in long-distance running is their training phenomenon at high altitude and close relationship between genetics and physical performance. Many factors in the interesting interaction between genotype and phenotype have been proposed in the attempt to explain the extraordinary success of Ethiopian as well as African runners. Increasing evidence shows that genetics may be a determining factor in physical and athletic performance (de

Lira *et al*., 2014) [3], (Taylor *et al*., 2016) [18]. The above research results were not based on evidence and no one researcher conducted the study around the real research area and nears to the athletes training and living altitude and then they couldn`t find out the real reason of the success of Ethiopian athletes.

1.5 The geography of Ethiopia

The Geography of Ethiopia and the Horn is, therefore, intended to familiarize the concerned sport professionals with the basic geographic concepts particularly in relation to Ethiopia geography with longitude, latitude and elevation. It is also meant to provide the concerned sport professionals a sense of place and oxygen that are pivotal in producing knowledgeable and competent professional citizens who are able to comprehend and analyze spatial problems and contribute to their solutions in the preparation and production of elite athletes. This geographical map that prepared by the researcher consists of six parts. The first part provides a brief description on the location of Ethiopia in Africa and shape of Ethiopia as well as the sample location point of Ethiopian athletes on the maps. Part two introduces the physical background of Ethiopia and altitude of same sample area of Ethiopian athletes, Part three provides location of the current Amhara regional state athletes sample in Ethiopia, part four provides sample location of the current Oromya regional state athletes sample in Ethiopia, part five provides the current SNNP regional state athletes sample in Ethiopia, part six provides location of the current Addis Ababa city administration athletes sample in Ethiopia.

1.6 Location of Ethiopia

Ethiopia is located in the horn of Africa. It is bordered by Eretria to the north, Djibouti and Somalia to the east, Sudan and South Sudan to the west, and Kenya to the south. Ethiopia has a high central plateau that varies from 1,290 to 3,000 m (4,232 to 9,843 ft) above sea level, with the highest mountain reaching 4,533 m (14,872 ft).

Elevation is generally highest just before the point of descent to the Great Rift Valley, which splits the plateau diagonally. The plateau gradually slopes to the lowlands of the Sudan on the west and the Somali-inhabited plains to the east. The highest peaks are found in the Semen and Bale ranges. The Semein (Northern) Mountains lie northeast of Lake Tanna and culminate in the snow-covered peak of Rass Dashen, which has an altitude of 4,550 m (14,928 ft). The Bale Mountains are separated from the larger part of the Ethiopian highlands by the Great Rift Valley, one of the longest and most profound chasms in Ethiopia.

The highest peaks of that range include Tullu Dimtu, the second-highest mountain in Ethiopia (4,377 m or 14,360 ft), Batu (4,307 m or 14,131 ft) and Chilalo (4,036 m or 13,241 ft). Parallel with the eastern escarpment are the heights of Billa 3,810 m (12,500 ft), Mount Abune Yossef, 4,190 m (13,747 ft), and Kollo, 4,300 m (14,108 ft), the last-named being southwest of Meqdela. Between Lake Tana and the eastern hills are Mount Guna, 4,210 m (13,812 ft), and In the Choqe Mountain of Misraq Gojame, Mount Choqe (also known as Mount Birhan) attains a height of 4,154 m (13,629 ft). Below 10° N, the southern portion of the highlands has more open tableland than the northern portion and fewer lofty peaks. Though there are a few heights between 3,000 and 4,000 m (9,843 and 13,123 ft), the majority do not exceed 2,400 m (7,874 ft), but the general character of the southern regions is the same as in the north: a much-broken hilly plateau. Adapted from Wikipedia location of Ethiopia.

2. Objectives

The objective of this research was to investigate Ethiopian athletes` success *in relation* with altitudinal variations, athletes' distribution and regional states contribution on athletes' production. The study specific objective was to investigate The success of Ethiopian athletes on Olympic competition since 1960, Ethiopian long and middle distance running athletes' training and living environment distribution, compared the training and competition area of different Olympic games hosted countries altitude and the winner athletes training altitude, to show different athletes production environment in Ethiopia used for the frame of reference to other investigators.

3. Material and Method

3.1 Research Design

The study used mixed methods research designs. Mixed methods research design is a combination quantitative and qualitative research methodology that has its` own advantage to analyze qualitative and quantitative data with single study and when the researcher wants to study the complex structure of family.

3.2 Research method

On the mixed method research design, the researcher was used Convergent Parallel research method that derived from mixed design. The purpose of using this method was to develop more complete understanding of the research problem by obtaining different harmonized data.

3.2.1 Sample size and population

The researcher was used as a sample population Ethiopian athletes, retired athletes, club athletes, project level athletes, 1500 among this population the researcher selected 326 target sample athletes who were elite athletes, project level athletes, different club employed athletes and retired athletes were participated in this on this specific study.

3.2.2 Sampling Techniques and Data Collection Method

The researcher had been selected the target sample with purposive sampling technique and collected the necessary data. The researcher was used both primary and secondary sources of data. The primary data was directly from the concerned bodies and the secondary source was different document analysis.

5. Organization

5.1 Geographical sample location

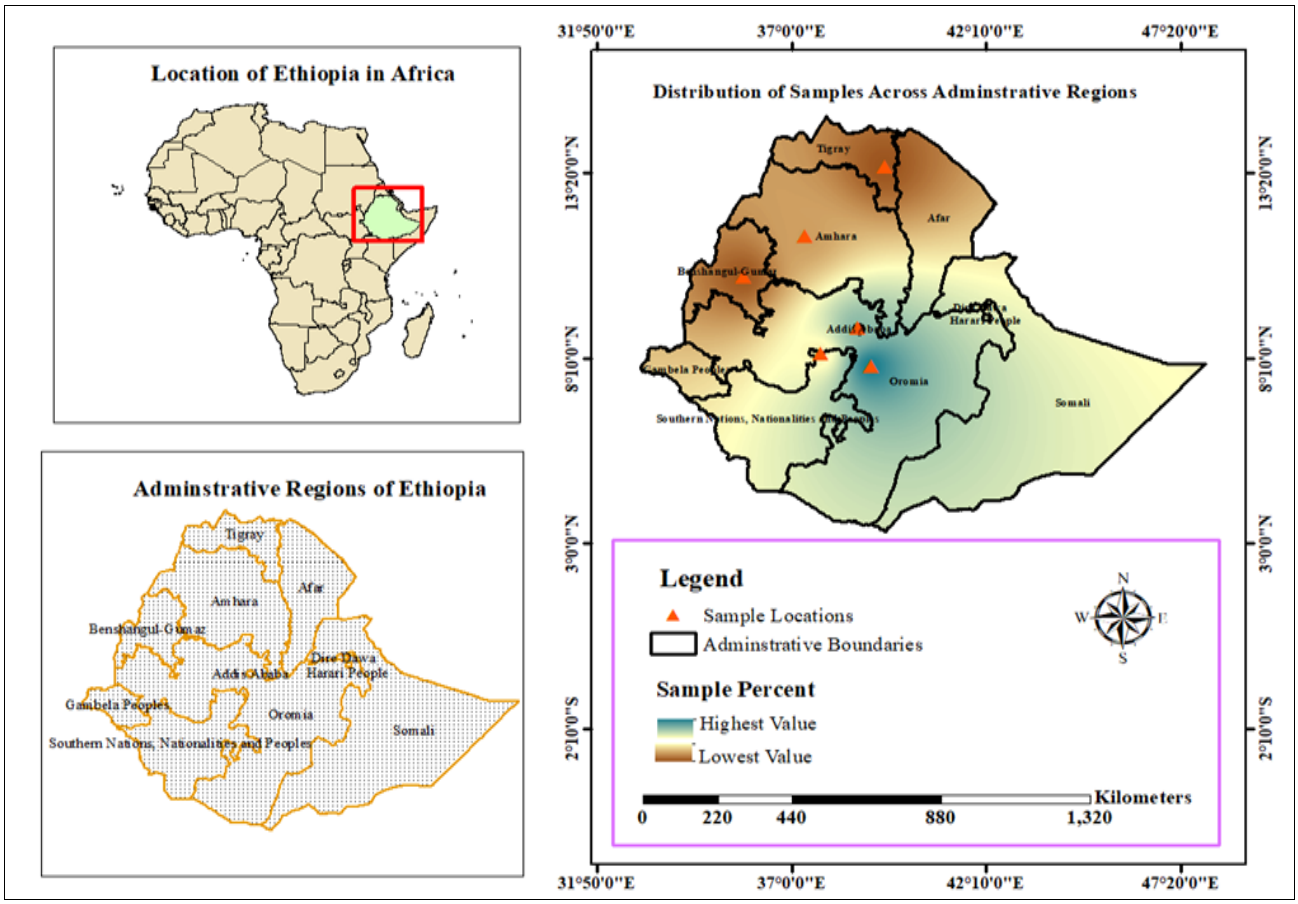

Fig 1: Map of Ethiopia

5.1.1 Altitude of same sample area of ETHIOPIAN athletes

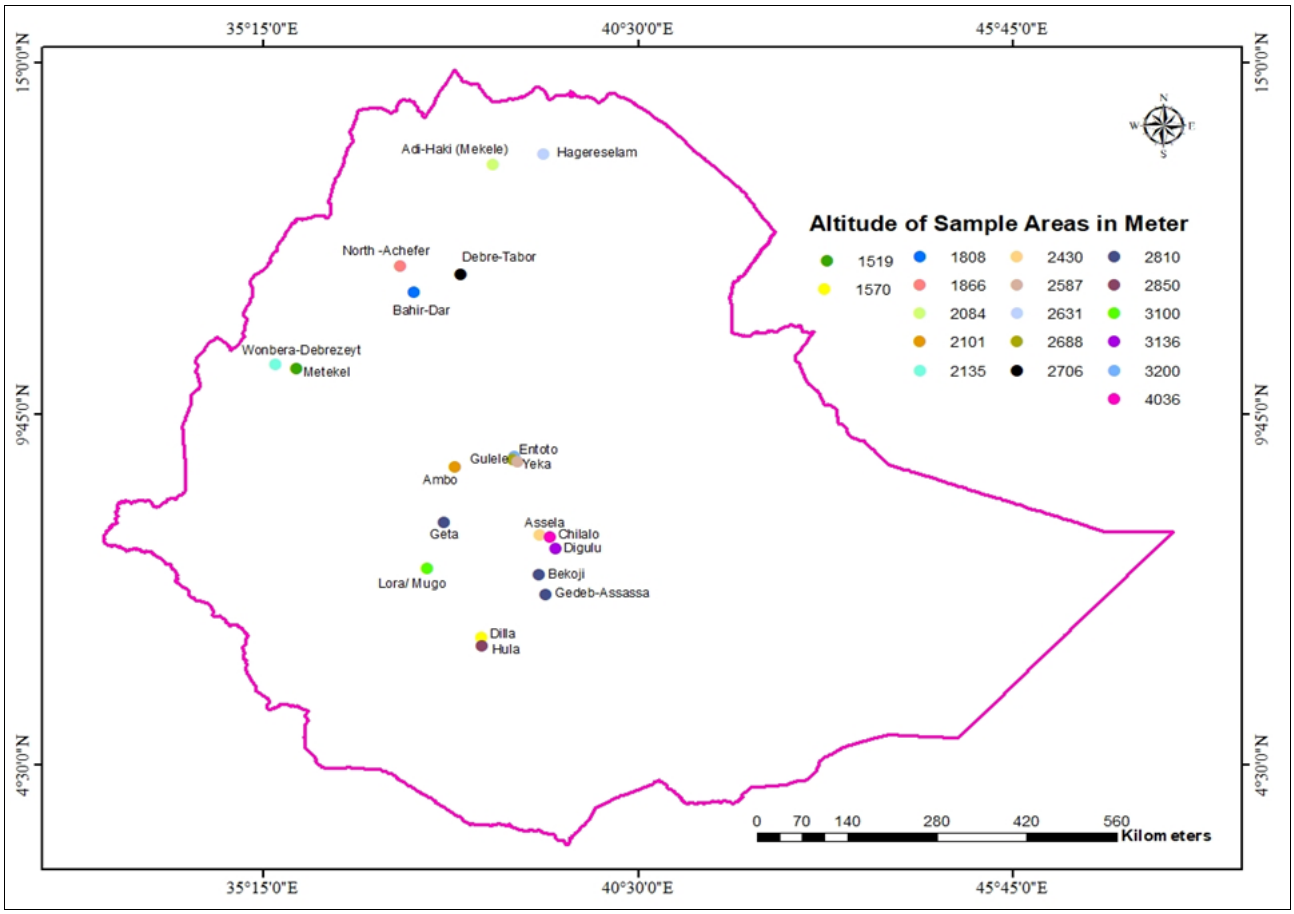

Fig 2: Altitude of Sample Area in Meter

The map indicators of same sample altitude in Ethiopia, that the current Ethiopian athletes living area of location from lowest altitude to the highest altitude area of the current Ethiopian athletes who were participated in this study. The total sample of the study were 326, among the total sample 115 (35.3%) were came from Oromiya regional state of Ethiopia, 33 (10.1%) of them came from Amhara regional state, 89 (27.3%) were from Addis Ababa, 61 (18.7%) of them from South Nation Nationality and People regional state including Sidam Regional state, 9 (2.8%) of them came from Tigray regional state, 19 (5.83%) of the athletes came from Benshangule Gumuze regional state. These were the total regional states of Ethiopia contribution and distribution of the current Ethiopian athletes.

5.1.2 Location of Amhara regional state in Ethiopia

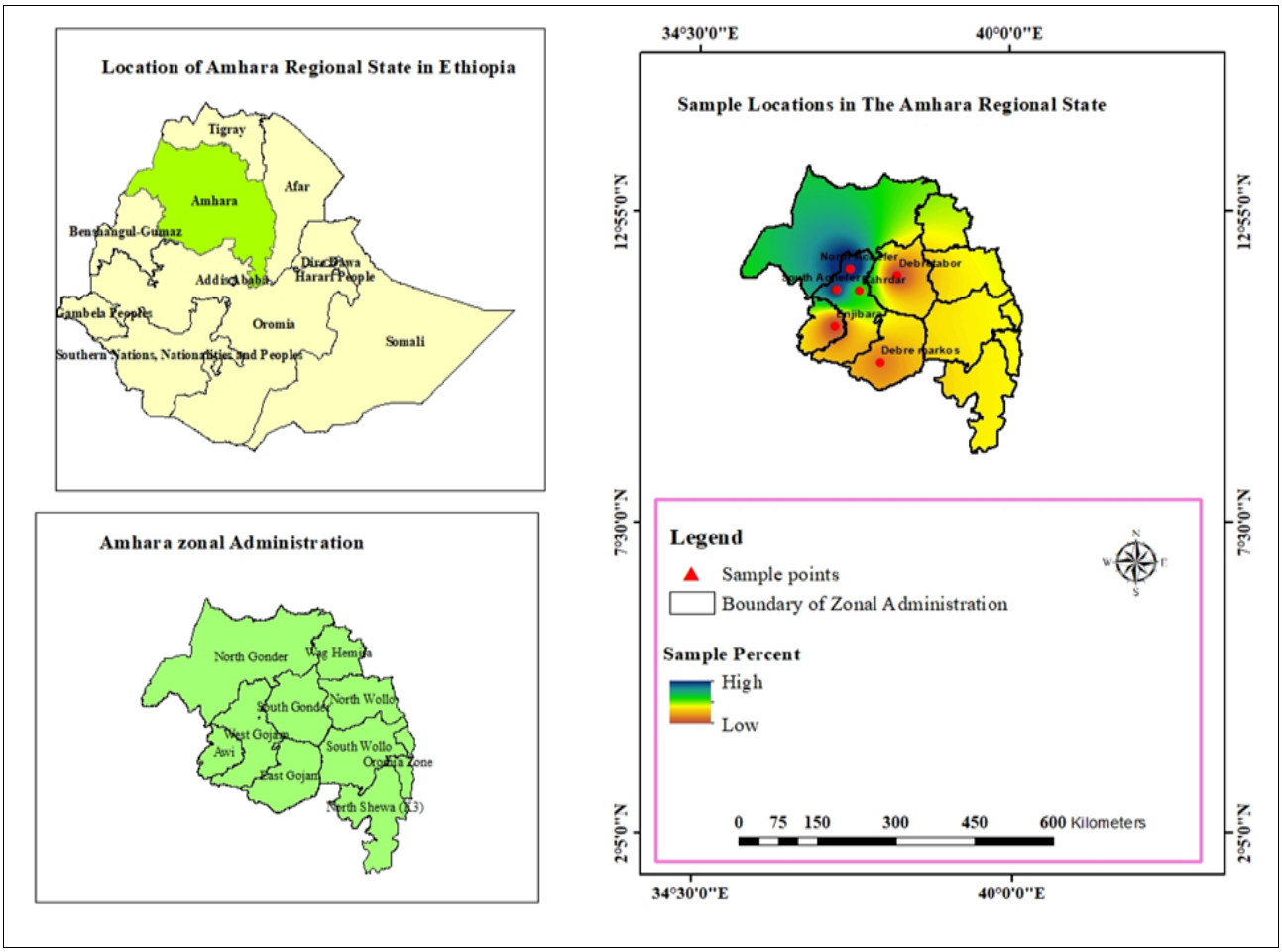

Fig 3: Altitude of Sample of Amhara Regional State

Zonal distribution of Amara regional state athletes who are currently employed in different athletics clubs, athletics project and participating on high level long and middle distance running competition in Ethiopia, international and Olympic level competition participant sample of the study were 33. Among those sample athletes 11 athletes came from North Achefer an altitude of 1866 meter, 9 athletes came from South Achefer an altitude of 2072 meter, 6 athletes came from Bahir Dar an altitude of 1808 meter above sea lebel, 3 athletes came from Debre markos an altitude of 2411 meter above sea lebel, 2 athletes came from Debre Tabore an altitude of 2706 meter and 2 athletes came from Enjibara an altitude of 2560 meter above sea level. This regional data used to show the current Ethiopian athletes zonal distribution and the contribution Amhara regional state to Ethiopian. Totally 10.1% of Ethiopian athletes who were participated in this study is came from Amhara regional state.

Table 1: Amhara Regional State Sample

Regional state	Sample Zone	Longitude	Latitude	Altitude	Number of sample	Percentage
Amhara	Bahir Dar	11.57421	37.36153	1808	6	18
Amhara	Debre Markos	10.32963	37.7344	2411	3	9
Amhara	Debre Tabor	11.85	38.01667	2706	2	6
Amhara	Enjibara	10.95	36.933	2560	2	6
Amhara	North Achefer	11.96666	37.1666	1866	11	34
Amhara	South Achefer	11.6	36.95	2072	9	28
Total					33	100

5.1.3 Location of Oromya regional state in Ethiopia

Zonal distribution of O regional state athletes who are currently employed in different athletics clubs, athletics project and participating on high level long and middle distance running competition in Ethiopia, international and Olympic level competition participant sample of the study

were 115 (35.38%) of the total contribution to the current Ethiopian athletes. Among those sample athletes 30 (9.2%) of athletes came from Assela an altitude of 2430 meter, 18 (5.5%) of athletes came from Chilalo an altitude of3036 meter,10 (3.6%) of athletes came from Tiyo an altitude of 2430 meter above sea lebel, 9 (2.7%) of athletes came from Gedeb Assassa an altitude of 2800 meter above sea lebel, 8(2.5%) of athletes came from Bekoji an altitude of 2810 meter, and 5(1.3%) of athletes came from Dandi an altitude of 3260 meter above sea level and 4(1.2%) of athletes came from Ambo an altitude of 3260 meter above sea level and 3(1.%) of athletes came from Abichu an altitude of 2738 meter above sea level and other area of Oromiya regional state were participated in this study those contribution less than 1% of the total Ethiopian athletes contribution. This regional data used to show the current Ethiopian athletes zonal distribution and the contribution Oromiya regional state to Ethiopian athletes production. Totally 35.38 % of Ethiopian athletes who were participated in this study is came from Oromiya regional state.

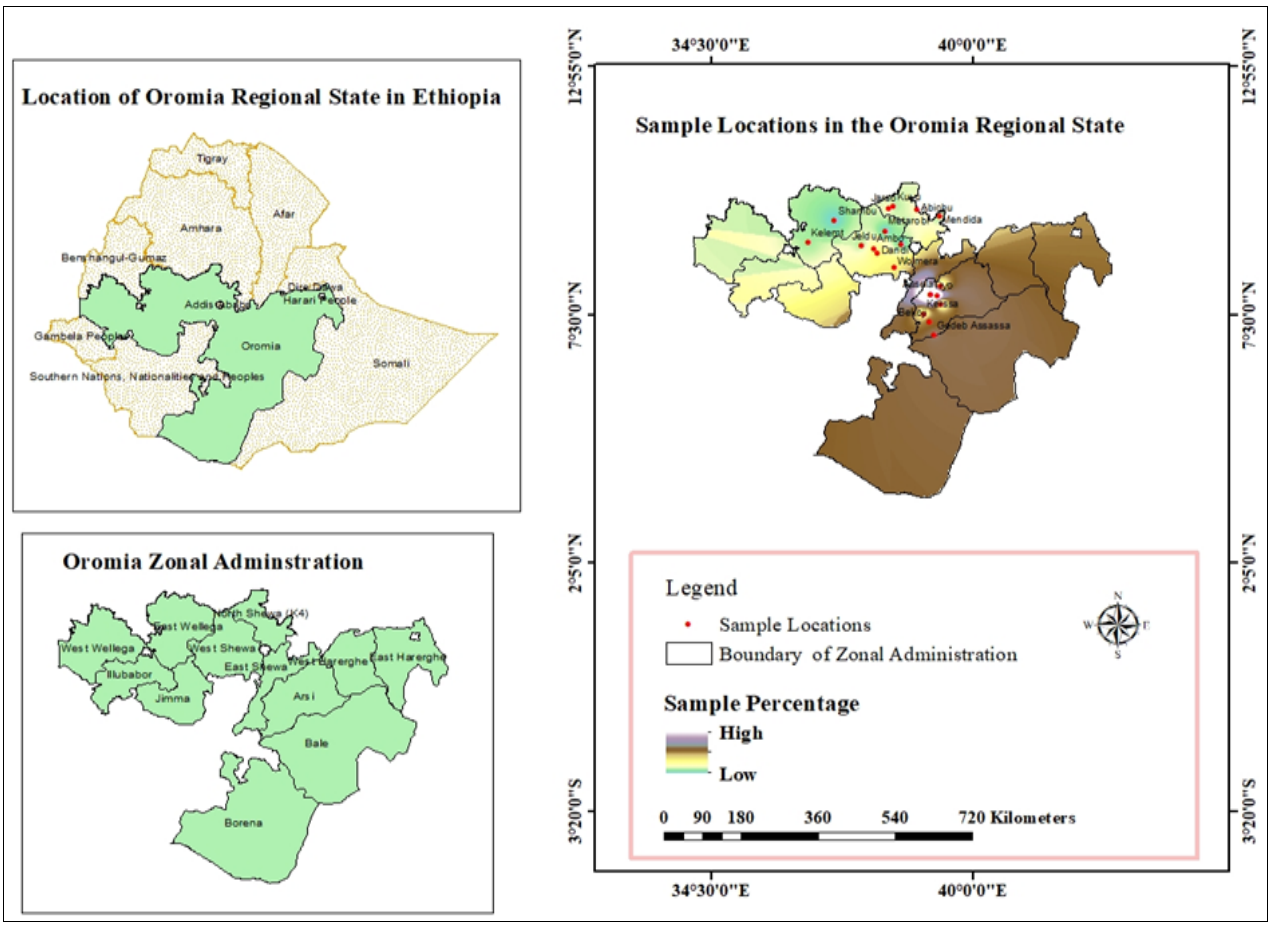

Fig 4: Sample Location of Oromya Regional State

5.1.4 Location of SNNP regional state in Ethiopia

Zonal distribution of South Nation Nationality and People (SNNP) regional state athletes who are currently employed in different athletics clubs, athletics project and participating on high level long and middle distance running competition in Ethiopia, international and Olympic level competition participant sample of the study were 61 (18.7%) of the total contribution of the current Ethiopian athletes. This sample included the new regional state separated from SNNPR the socalled Sidama zone included. Among those sample athletes 12 (3.7%) of athletes came from Hulla an altitude of 2850 meter above seaa level, 11 (3.38%) of athletes came from Geta woreda of Gurage an altitude of 2810 meter, 7 (2.1%) of athletes came from Hagereselam Sidama an altitude of 2850 meter above sea lebel, 7(2.1%) of athletes came from Lera/Mugo of Silte Zone an altitude of 3100 meter above sea lebel, 4 (1.2%) of athletes came from Limu Hadiya an altitude of 2188 meter, 3 (0.9%) of athletes came from Tulla Sidama an altitude of 1980 meter above sea level, 6 athletes (1.8%) of athletes came from Alicho Wuriro, Boditi and Dilla each of them 2 athletes an altitude of 2512, 2050 and 1570 meter above sea leve sequencially and the other 1(0.3%) of athletes came from Halaba Kulito an altitude of 2070 above sea level, Wolkite and Kibet each 1 athletes with their altitude of 1935 and 2108 meter above sea level sequencially. This regional data used to show the current Ethiopian athletes zonal distribution and the contribution Amhara regional state to Ethiopian. Totally 18.7% of Ethiopian athletes who were participated in this study is came from SNNP regional state.

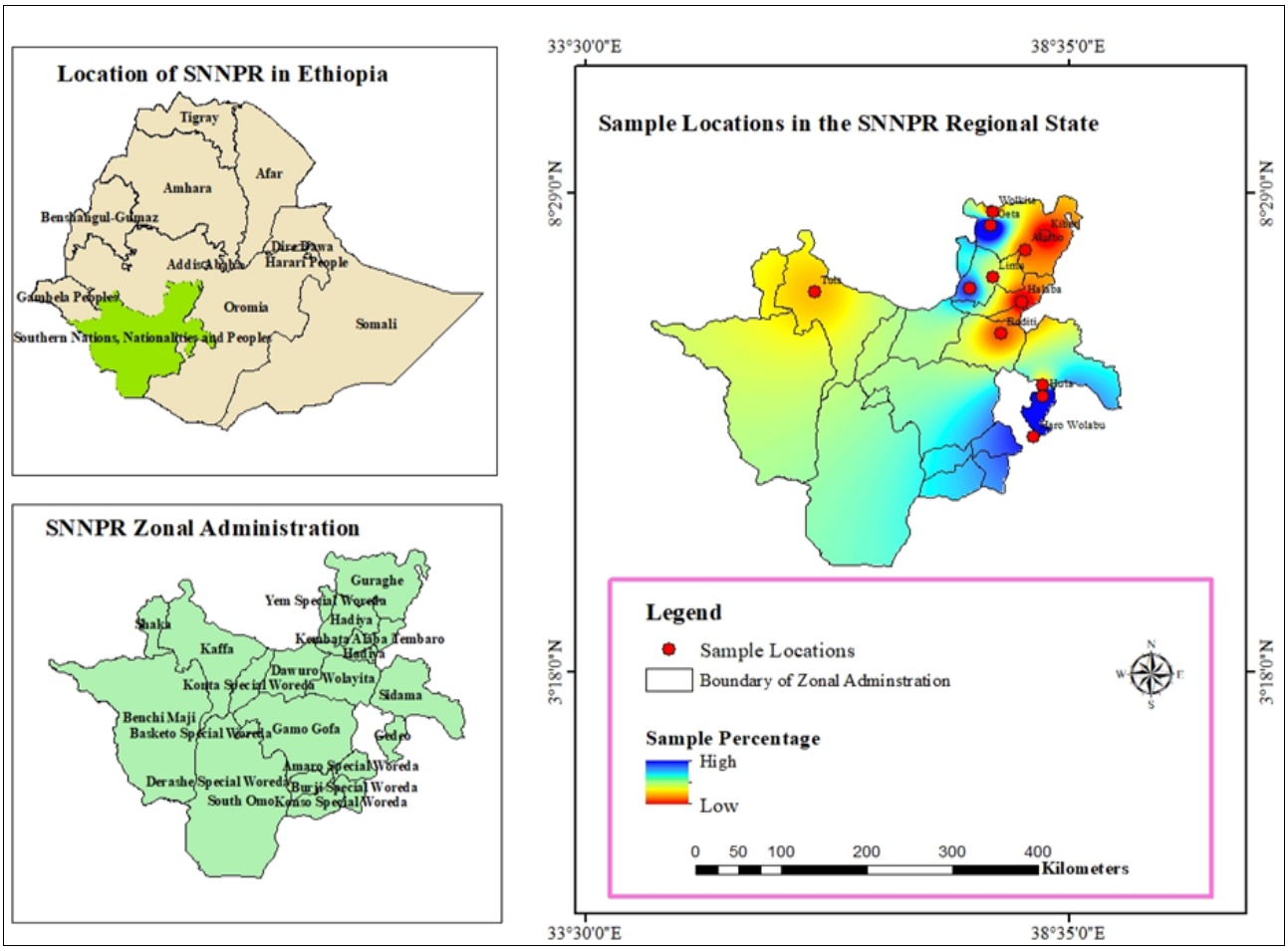

Fig 5: Sample Location of SNNP Regional State

5.1.5 Location of Addis Ababa city administration in Ethiopia

Addis Ababa City administration distribution based on sub-city administration level athletes who are currently employed in different athletics clubs, athletics project and participating on high level long and middle distance running competition in Ethiopia, international and Olympic level competition participant sample of the study were 89 (27.3%) of the total contribution of the current Ethiopian athletes. Among those sample athletes 26 (8%) of athletes came from Yeka sub-city an altitude of 2587 meter above seaa level, 16% (4.9%) of athletes came from Koteb in Yeka an altitude of 2587 Totally Yeka Sub-City 42 (13%) of athletes cam from an altitude of 2587 meter above sea level, 715(4.6%) of athletes came from Bole Sub-City an altitude of 2324 meter above sea lebel, 10 (3.1%) of athletes came from Gulele Sub-City an altitude of 2688 meter above sea lebel, 12 (9.5%) of athletes came from Arada, Lideta and Nifas Silk Lafto Sub-City an altitude of 2436, 2362 and 2224 meter above sea level sequencially and each of 4 athletes, 6 (1.8%) of athletes came from Kirkos Sub-City an altitude of 2332 meter above sea level, 4 athletes (1.2%) of athletes came from Adis Ketema, Akaki, Kolfe and Abado each of them 1 athletes an altitude of 2294, 2125 and 2551 and 2570 meter above sea leve sequenciallyl. This regional data used to show the current Ethiopian athletes in Addis Ababa City Sub-City distribution and the contribution to Ethiopian. Totally 89 (27.3%) of Ethiopian athletes who were participated in this study is came from Addis Ababa City Administration.

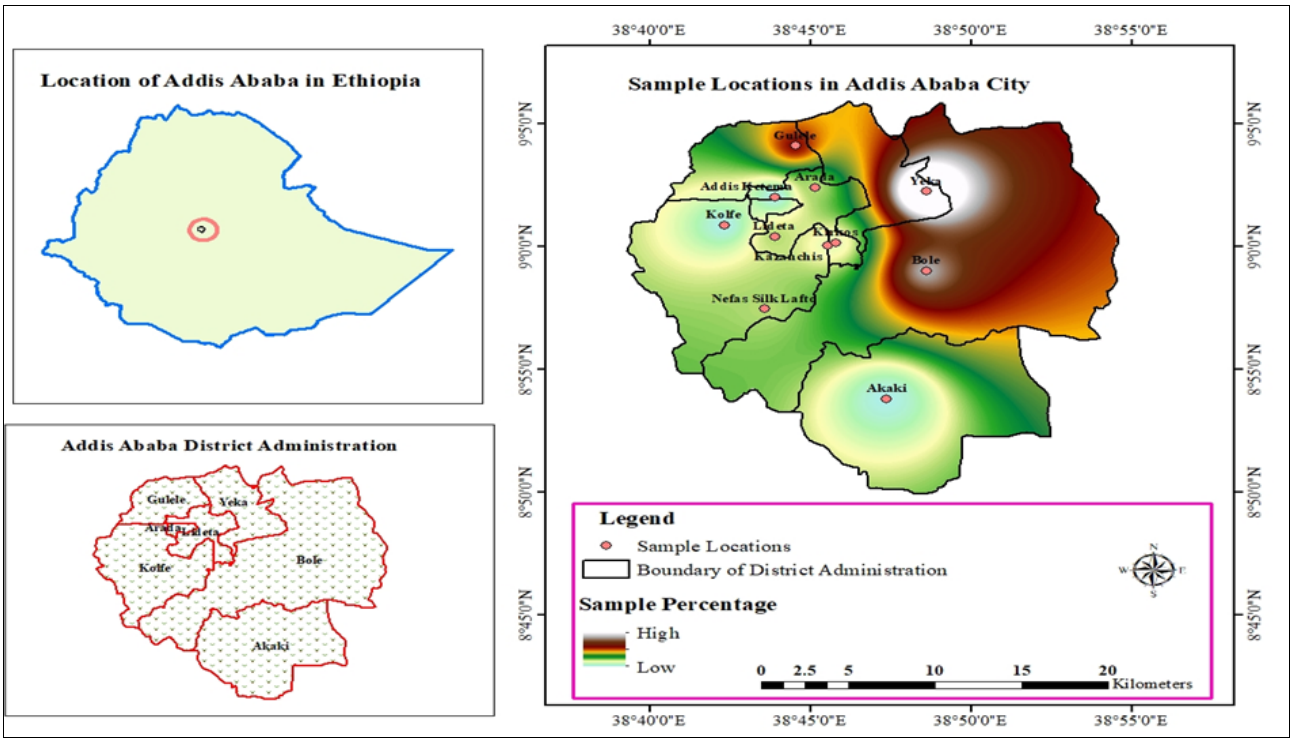

Fig 6: Sample location of Addis Ababa City

5.1.5 Tigray regional state

Zonal distribution of Tigray regional state athletes who are currently employed in different athletics clubs, athletics project and participating on high level long and middle distance running competition in Ethiopia, international and Olympic level competition participant sample of the study were 9 (2.7%) of the total contribution of the current Ethiopian athletes. This sample population is not indicator of the Tigray regional state of Ethiopia because of the problem of the current military conflicts between Ethiopian army and the Tigray libration front group hindered to collect the necessary data from that specific area. Some of this study participants were living in Addis ababa during this data collection. Among those sample athletes 5 (1.5%) of athletes came from Mekele City an altitude of 2254 meter above seaa level, 4 (1.2%) of athletes came from Adi Haki an altitude of 2084 meter and 1 (0.3%) of athletes came from Hagereselam Tigray an altitude of 2631 meter above sea lebel, This regional data used to show the current Ethiopian athletes zonal distribution and the contribution Tigray regional state to Ethiopian but not the real indicator of Tigray data that was not collected from Tigray, because of the current conflict and the area was war zone.

5.1.6 Benshangul Gumuz regional state

Benshangul Gumuz regional state located on the western Ethiopian bordered with Sudan, Amhara regional state and Oromiya regional state. Zonal distribution of Benshangul Gumuz regional state athletes who are currently employed in different athletics clubs, athletics project and participating on high level long and middle distance running competition in Ethiopia, international and Olympic level competition participant sample of the study were 19 (5.8%) of the total contribution of the current Ethiopian athletes. Among those sample athletes 19 (5.8%) of athletes came from Wonbera Debrezeyit an altitude of 2135 meter above seaa level, This regional data used to show the current Ethiopian athletes zonal distribution and the contribution Benshangul Gumuz regional state to Ethiopian, but the data indicated that unfortunatlly the data collected from an athletes who were come from Debrezeyite of Benshangul Gumuz regional state.

5.2 The current Ethiopian athletes locational data

The following table included the demographic data of the current Ethiopian athletes who have been participating in different long and middle distance running in the world as well as in Ethiopia and some of them are trainee in different athletics club, project and sport academies.

The table data showed that the demographic distribution of Ethiopian athletes based on the sample location indicators of longitude, latitude and altitude/elevation of the current Ethiopian athletes address where they were grown up.

Table 2: Sample Demographic Data of Ethiopian Athletes

RegionalState	Sample location	Latitude	Longitude	Elivation in Meter	Frequency	Percent	Valid Percent	Cumulative Percent
Addis Ababa	Addis Ketema	9.3391	38.7253	2294	1	0.3	0.3	0.3
Addis Ababa	Akaki	8.8964	38.7891	2125	1	0.3	0.3	0.6
Addis Ababa	Arada	9.036	38.7523	2436	4	1.2	1.2	1.8
Addis Ababa	Bole	8.976944	38.8	2324	15	4.6	4.6	6.4
Addis Ababa	Entoto	9.115556	38.7722	3,200	1	0.3	0.3	6.7
Addis Ababa	Gulele	9.068092	38.7420	2688	10	3.1	3.1	9.8
Addis Ababa	Janmeda	9.083	38.834	2587	3	0.9	0.9	10.7
Addis Ababa	Kazanchis	9.0003	38.7591	2332	3	0.9	0.9	11.6
Addis Ababa	Kirkos	9.0003	38.7591	2332	3	0.9	0.9	12.5
Addis Ababa	Kolfe	8.95118	38.6875	2551	1	0.3	0.3	12.8

Addis Ababa	Kotebe	9.083	38.834	2587	16	4.9	4.9	17.7
Addis Ababa	Lideta	9.0036	38.7261	2362	4	1.2	1.2	18.9
Addis Ababa	Nefas Silk Lafto	8.9481701	38.7327	2224	4	1.2	1.2	20.1
Addis Ababa	Yeka	8.083	38.834	2587	23	7.1	7.1	27.2
Amhara	Bahir Dar	11.574208	37.3615	1808	6	1.9	1.9	29.1
Amhara	Debre Markos	10.329634	37.7344	2411	3	0.9	0.9	30.0
Amhara	Debre Tabor	11.85	38.0166	2706	2	0.6	0.6	30.6
Amhara	Enjibara	10.95	36.933	2560	2	0.6	0.6	31.2
Amhara	North Achefer	11.96666	37.1666	1866	11	3.4	3.4	34.6
Amhara	South Achefer	11.6	36.95	2072	9	2.8	2.8	37.4
Benshangul Gumuz	Wonbera Debrezeyt	10.5	35.4167	2135	19	5.8	5.8	43.2
Oromya	Abichu	9.8167	38.85	2738	3	0.9	0.9	44.1
Oromya	Ambo	8.9580605	37.9321	2101	4	1.2	1.2	45.3
Oromya	Assela	7.95	39.117	2,430	30	9.2	9.2	54.5
Oromya	Bekoji	7.35	39.1	2810	8	2.5	2.5	57.0
Oromya	Chilalo	7.916666	39.2666	4,036	18	5.5	5.5	62.5
Oromya	Dandi	8.842777	38.0113	3260	5	1.5	1.5	64.0
Oromya	Digalu	7.74	39.35	3136	1	0.3	0.3	64.3
Oromya	Gedeb Assassa	7.06	39.2	2810	9	2.8	2.8	67.1
Oromya	Holeta	9.05	38.5	2391	1	0.3	0.3	67.4
Oromya	Huruta	8.15	39.35	2,700	2	0.6	0.6	68.0
Oromya	Jarso	9.833	38.25	2383	3	0.9	0.9	68.9
Oromya	Jeldu	9.0167	37.6666	2096	2	0.6	0.6	69.5
Oromya	Kelemt	9.083	36.55	2088	2	0.6	0.6	70.1
Oromya	Kerssa	7.53	38.983	2784	3	0.9	0.9	71.0
Oromya	Kuyu	9.8667	38.35	2557	2	0.6	0.6	71.6
Oromya	Legedadi	9.08333	38.9167	2450	1	0.3	0.3	71.9
Oromya	Legetafo	9.093333	38.8655	2460	3	0.9	0.9	72.8
Oromya	Mendida	9.6569	39.3164	2812	2	0.6	0.6	73.4
Oromya	Metarobi	9.3333	38.1667	2473	1	0.3	0.3	73.7
Oromya	Shambu	9.5666667	37.1	2503	1	0.3	0.3	74.0
Oromya	Tiyo	7.94	39.13	2490	10	3.1	3.1	77.1
Oromya	Wolmera	8.54	38.36	3191	5	1.5	1.5	78.6
SNNPR	Alicho	7.87	38.13	2512	2	0.6	0.6	79.2
SNNPR	Boditi	6.96666	37.8666	2050	2	0.6	0.6	79.8
SNNPR	Dilla	6.4105	38.3102	1570	2	0.6	0.6	80.4
SNNPR	Geta	8.1333	37.7667	2810	11	3.4	3.4	83.8
SNNPR	Hagereselam	6.29	38.31	2850	7	2.2	2.2	86.0
SNNPR	Halaba	7.3127	38.088	2078	1	0.3	0.3	86.3
SNNPR	Haro Wolabu	5.8405556	38.2133	2993	7	2.2	2.2	88.5
SNNPR	Kibet	8.02	38.33	2108	1	0.3	0.3	88.8
SNNPR	Lera/Mugo	7.44877	37.5414	3100	7	2.2	2.2	91.0
SNNPR	Limu	7.57	37.79	2188	4	1.2	1.2	92.2
SNNPR	Wolkite	8.2833	37.7833	1935	1	0.3	0.3	92.5
SNNPR	Hula	6.29	38.31	2850	12	3.8	3.8	96.3
SNNPR	Tula	7.4166	35.9166	1980	3	0.9	0.9	97.2
Tigray	Adi Haki	13.4833	39.4667	2084	3	0.9	0.9	98.1
Tigray	Hagere Selam Tigray	13.650295	39.1725	2,631	1	0.3	0.3	98.4
Tigray	Mekele	13.49355	39.4657	2254	5	1.6	1.6	100

Ethiopia on the Olympic sport participation started since 1956 Olympics without medal and since 1960 Rome Olympic dominating long and middle distance running in Olympic game as well as other types of competition. Ethiopian long distance running athletes have been dominating long distance and middle distance running on different types competition those have being pulled in different continental and varies weather condition. (Wishnizer *et al*., 2013) [20], (Scott *et al*., 2003) [13] Ethiopia have been participated 14 Olympic competition participation history since 1956 and 58 Olympic medals winner since 1960 with specific running events of marathon, 10,000m 5,000m 3,000 meter steeplechase and 1,500 meter. Ethiopia on the Olympic participation has been won 23 gold medals, 12 silver and 23 bronze Olympic medals.

Although Ethiopia is at the height tower of long and medium-distance racing on the world stage, it is ranked the best in the world, and the results so far have been demonstrated by the personal efforts of the athletes not by modern training and infrastructure. The current performance of Ethiopian athletes on athletics sport has been tested to prove by this research work that it is the personal effort of the athletes, not the help of modern training and infrastructure. It is believed that if Ethiopian athletics had previously been aided by modern training and infrastructure and the current beginnings were applied, the Ethiopian economy would have been better supported by athletic sport.

Different researchers said about Ethiopian elite athletes almost all are just came from high altitude area above 2500meter above sea level; but this study result was different from the above assumption that Ethiopian athletes distribution based on location and altitude are different from the above research results. The current study result and distribution of Ethiopian Olympic team participants and winners athletes were came from more than eight regional states of Ethiopia and sample locations are presented in the following table that

included athletes birth place, athletes name altitude and the host country altitude to compare the effect of altitude on performance and the distribution of Ethiopian athletes based on their birth place.

5.3 Ethiopian athletes olympic success, competition area altitude and birth place altitude

Table 3: Ethiopian olympic medalist success related data

No.	Year	Host country	Competition Altitude	Name of athlete	Birth Place Altitude	Types of Event	Result	Place of Birth
1	1960	Rome	13m	Abebe Bikila	2,355m	Marathon	Gold	Shewa
2	1964	Tokyo	40m	Abebe Bikila	2,355m	Marathon	Gold	Shewa
3	1968	Mexico	2,240m	Mamo Wolde	1720	Marathon	Gold	Ada`a
4	1968	Mexico	2,240m	Mamo Wolde	1920m	10,000m.	Silver	Ada`a
5	1972	Munich	520m	Mamo Wolde	1920	Marathon	Bronze	Ada`a
6	1972	Munich	520m	Miruts Yifter	2346m	10,000m	Bronze	Adigrat
7	1980	Moscow	156m	Miruts Yifter	2346m	10,000m	Gold	Adigrat
8	1980	Moscow	156m	Miruts Yifter	2346m	5,000	Gold	Adigrat
9	1980	Moscow	156m	Mohamed Kedir		10,000m	Bronze	
10	1980	Moscow	156m	Eshetu Tura	1120m	3,000 Stpc	Bronze	Pawe
11	1992	Barcelona	12m	Derartu Tulu	2810m	10,000m	Gold	Bekoji
12	1992	Barcelona	12m	Adis Abebe	1382m	10,000m	Bronze	Raya
13	1992	Barcelona	12m	Fita Bayisa	2101m	5,000m	Bronze	Ambo
14	1996	Atlanta	320m	Haile Gebresilasie		10,000m OR	Gold	Assela
15	1996	Atlanta	320m	Fatuma Roba	2810m	10,000	Gold	Bekoji
16	1996	Atlanta	320m	Gete Wami	2840m	10, 000	Gold	Debrebrihan
17	2000	Sydney	80m	Gezahegne Abera	2215m	Marathon	Gold	Eteya
18	2000	Sydney	80m	Haile Gebresilasie		10,000	Gold	Assela
19	2000	Sydney	80m	Derartu Tulu	2810m	10,000 OR		Bekoji
20	2000	Sydney	80m	MIlion Welde	2355m	5,000	Gold	Addis Ababa
21	2000	Sydney	80m	Gete Wami	2810m	10,000	Silver	Bekoji
22	2000	Sydney	80m	Assefa Mezgebu	2200m	10,000	Bronze	Sidama
23	2000	Sydney	80m	Tesfaye tola		Marathon	Bronze	
24	2000	Sydney	80m	Gete Wami	2810m	5,000	Bronze	Bekoji
25	2004	Athens	194m	Kenenisa Bekele	2810m	10,000m	Gold	Bekoji
26	2004	Athens	194m	Meseret Defar	2355m	5,000m	Gold	Addis Ababa
27	2004	Athens	194m	Kenenisa bekele	2810m	5,000m	Silver	Bekoji
28	2004	Athens	194m	Ejigayehu Dibaba	2810m	10,000m	Silver	Bekoji
29	2004	Athens	194m	Sileshi Sihine	2918m	10,000m	Silver	Sheno
30	2004	Athens	194m	Tirunesh Dibaba	2810m	5,000m	Bronze	Bekoji
31	2004	Athens	194m	Derartu Tulu	2810m	10,000m	Bronze	Bekoji
32	2008	Beijing	44m	Kenenisa bekele	2810m	10,000m OR	Gold	Bekoji
33	2008	Beijing	44m	Kenenisa bekele	2810m	5,000m OR	Gold	Bekoji
34	2008	Beijing	44m	Tirunesh Dibaba	2810m	10,000m OR	Gold	Bekoji
35	2008	Beijing	44m	Tirunesh Dibaba	2810m	5,000m	Gold	Bekoji
36	2008	Beijing	44m	Sileshi Sihine	2918m	10,000m	Silver	Sheno
37	2008	Beijing	44m	Meseret Defar	2355m	5,000m	Silver	Addis Ababa
38	2008	Beijing	44m	Tsegaye Kebede	2670m	Marathon	Bronze	GirarBer/AA
39	2012	London	11m	Meseret Defar	2355m	5,000m	Gold	Addis Ababa
40	2012	London	11m	Tirunesh Dibaba	2810m	10000m	Gold	Bekoji
41	2012	London	11m	Tiki Gelana	1934	Marathon OR	Gold	Jigjiga
42	2012	London	11m	Dejen Gebremeskel	2457m	5,000m	Silver	Adigrat
43	2012	London	11m	Sofia Assefa	2355m	3,000m Stpc		Addis Ababa
44	2012	London	11m	Tariku Bekele	2810	10,000m	Bronze	Bekoji
45	2012	London	11m	Tirunesh Dibaba	2810	5,000m	Broze	Bekoji
46	2012	London	11m	Abeba Aregawi	2457m	1,500m	Bronze	Adigrat
47	2016	Rio De J.	33m	Almaz Ayana	2097m	10,000	Gold	Benshangul
48	2016	Rio De J.	33m	Genzebe Dibaba	2810m	5,000	Silver	Bekoji
49	2016	Rio De J.	33m	Feyisa Lelisa	2096m	Marathon	Silver	Jeldu
50	2016	Rio De J.	33m	Tamirat Tola [17]		10,000m	Bronze	
51	2016	Rio De J.	33m	Mare Dibaba	2810m	Marathon	Bronze	Bekoji
52	2016	Rio De J.	33m	Almaz Ayana	2097	5,000m	Bronze	Benshangul
53	2016	Rio De J.	33m	Hagos Gebrehiwet	1560m	5,000m	Bronze	Tsa`da Imba
54	2016	Rio De J.	33m	Tirunesh Dibaba	2810m	10,000m	Bronze	Bekoji
55	2020	Tokyo	40m	Solomon Barega	2700m	10,000	Gold	Geta/Bitara
56	2020	Tokyo	40m	Lemecha Girma	2430m	3,000m Stpc	Silver	Assela
57	2020	Tokyo	40m	Gudaf Tsegaye	2254	5,000m	Bronze	Tigray
58	2020	Tokyo	40m	Letesenbet Gidey	2254	10,000m	Bronze	Tigray
59	2020	Tokyo	40m	Sifan Hassen Eth/ For Netherland	1712m	10,000	Gold	Adama
60	2020	Tokyo	40m	Kalkidan Gezahegn Eth/ for Bahrain	2355m	10,000m	Silver	Addis Ababa

Comparable data of Olympic medalist of Ethiopian athletes based on their local area

Table 4: Ethiopian Olympic Medalist Training and Living Place Location Data

No.	Athletes specific area /CITY/	Number of athletes	Number of medal	Valid percent	Cumulative percent %
1	Adama	1	1	2.7	2.7
2	Addis Ababa	5	9	13.3	16.
3	Adigrat	3	5	8.3	24.3
4	Ambo	1	1	2.7	27.0
5	Assela /Eteya	3	5	8.1	35.1
6	Bekoji	9	18	24	59.1
7	Bishoftu Ada`a	2	4	5.4	64.5
8	Debrebirhan	1	1	2.7	67.2
9	Gigjiga	1	1	2.7	69.9
10	Gurage	1	1	2.7	72.6
11	Jeldu	1	1	2.7	75.3
12	Mekele	3	3	8.3	83.6
13	Pawe	1	1	2.7	86.3
14	Raya	1	1	2.7	89.0
15	Shewa	2	3	5.6	94.4
16	Sheno	1	1	2.7	97.3
17	Sidama	1	1	2.7	100

Table 3 Ethiopian Olympic winner and medalist training and living altitude indicated that 24% of the medalist come from Bekoji area, that most the role models of Ethiopian athletes came from this specific area and similar to this area 19% of the Olympic winners were came from Tigray regional state specifically Adigrat and Mekele, this shown us there is big contribution of Olympic medalist athletes in Ethiopian history and the result is the indicator of athlete development area all over Ethiopia. The above table result shown us Ethiopian athletes distribution all over the country and if the government effort applied on the above area or all parts of Ethiopia are suitable to build athletics training project. The result as regional states of Ethiopia more contribution was from Oromya regional state.

6. Result and Discussion

6.1 Result

This study result compiled based on the data organization parts of the study. the demographic data on the table included the current Ethiopian athletes who have been participating in different long and middle distance running in the world as well as in Ethiopia and some of them are trainee in different athletics club, project and sport academies were came from different elevation and different regional states of Ethiopia. The current Ethiopian athletes` lowest altitude is 1519meter and 1570meter above sea level, the medium altitude is 2001 - 2130 meter above sea level and the highest altitude is 2500 – 4036 meter above sea level. The total 326 sample locations indicated that the current Ethiopian athletes' distribution based on altitude were different that almost more than eight regional states athletes were participated on this study and on different long and middle distance running in Ethiopia as well as in different international competition including Olympic game. The current Ethiopian athletes are not the same ethnic group and there is no majority group of area or regional state in Ethiopia. The Olympic winners of Ethiopian athletes since 1960 Rome Olympic were come from all over the country. The current Ethiopian athletes birth place altitude from 1500 meter to 3036 meter above sea level. Almost all Olympic competition had been held on low altitude that held between 11m and 520 meter above sea level, except Mexico Olympic. all Ethiopian Olympic winners athletes came from high altitude area and all competitions were on low land and then their training had been given chance to win the long distance running than other throwing and jumping event.

The current performance of Ethiopian athletes on athletics sport has been tested to prove by this research work that it is the personal effort of the athletes, not the help of modern training and infrastructure. It is believed that if Ethiopian athletics had previously been aided by modern training and infrastructure and the current beginnings were applied, the Ethiopian economy would have been better supported by athletic sport.

7. Conclusion

In addition to different document analysis there were 326 Ethiopian athletes directly participated on altitude related variable of this specific study and 83 high level athletes were participated on Ethiopian athletes running success related variables.

The repeated success of middle and long distance running by different regions of the world is not a new phenomenon. Researchers are nevertheless to confirm a genetic or physiological advantage in being a middle or long distance runner of East African origin, and it is most likely that the reasons for their success are many.

Based on this study result of Ethiopian long and middle distance running runners success is the athletes motivation to alleviate their economic problems and to achieve economic goal. The athletes` strong desire came from their role models who solved their economic problem through long and middle distance running competition participation.

Relatively the world long distance running results controlled with east African countries called Ethiopian and Kenyan known as Arisi tribe and Kallenjian tribes.(Onywera *et al*., 2006) [12], (Dr.S.Jayaraman, 2016),(Wilber & Ptsiladis, 2012) [19]. The researchers said about Ethiopian elite athletes almost all are just came from high altitude area; specifically they came from above 2500 meters above the sea level. But this study result was different from the above assumption that Ethiopian athletes distribution based on location and altitude are different from the above research results. The current study result and distribution of Ethiopian athletes are come from more than eight regional states of Ethiopia and sample locations are presented in the table and graph showed the elevation from 1500 meter to 3036 meter above sea level. Based on the data of this research result, Ethiopian athletes were not come from single geographical location or elevation. The Olympic winners of Ethiopian athletes since 1960 got 58 medals and among those 23 were gold, 12 medals were silver

and 23 medals were bronze. The athletes birth place were different Ethiopian regional states and altitude that is described on table 3 are shows different elevation from 1500 meter to 3036 meter above sea level

The current Ethiopian athletes birth place altitude from 1500 meter to 3036 meter above sea level. This Ethiopian athletes` altitude relation distribution is not unique for other countries in Africa as well as in the world. All world countries whose location are nears to the above altitude have equal chance to altitude related success of long and middle distance running. In addition to this altitude related question, Ethiopian long and middle distance runners when joined to formal running training with low socioeconomic status and then they have been faced economic problem, when they were trainee, to solve this problem Ethiopian long and middle distance runners had been designed to have strong desire to overcome economic problem through athletics sport, because economic problems can motivate to get good running performance in Ethiopia.

Almost all Olympic competition had been held on low altitude that held between 11m and 520 meter above sea level, except Mexico Olympic. all Ethiopian Olympic winners athletes came from high altitude area and all competitions were on low land and then their training had been given chance to win the long distance running than other throwing and jumping event, because of the low land area have more challenging area to throwing and jumping events that related with force of gravity. The altitude increased the gravitational force of attraction on the earth will be decrease and the altitude decreased the gravitational attraction of the earth will be increased. Based on this, throwing and jumping event training with low altitude improve the performance of athletes.

Ethiopia is at the height tower of long and medium-distance racing on the world stage, it is ranked the best in the world, and the results so far have been demonstrated by the personal efforts of the athletes not by modern training and infrastructure. The current performance of Ethiopian athletes on athletics sport has been tested to prove by this research work that it is the personal effort of the athletes, not the help of modern training and infrastructure. It is believed that if Ethiopian athletics had previously been aided by modern training and infrastructure and the current beginnings were applied, the Ethiopian economy would have been better supported by athletic sport.

Different researchers described Ethiopian elite athletes, almost all are just came from high altitude area above 2500meter above sea level; but this study result was different from the above researchers assumption that Ethiopian athletes distribution based on location and altitude are different from the above research results. The current study result and distribution of Ethiopian Olympic team participants and winners athletes were came from more than eight regional states of Ethiopia and sample locations are presented on the table 3 that included athletes birth place, athletes name altitude and the host country altitude to compare the effect of altitude on performance and the distribution of Ethiopian athletes based on their birth place.

Finally I would like to recommended that the study on the article of Ethiopian athletes` success with altitudinal variations, athletes` distribution and regional states contribution on to athletes production related research shown as there was different assumption of the previous study results and the current Ethiopian elite athletes and other the footsteps athletes' altitudinal distribution was diverse, their training infrastructure is so poor, their training style was not supported by sophisticated scientific method. But their living altitude and every competition area of the world less elevation than Ethiopian athletes living area and this helps to them live high train low at high altitude principle helped them to be successful.

Based on this the training area and competition area should be varied. Competition and training at high altitude have equal chance to all participants but Ethiopian and east African were successful at high altitude like Mexico Olympic game that was 2240 meter above sea level, because of other related variation of Ethiopian athletes that related with socioeconomic status, motivation to alleviate their economic problems and their role models effects were helped them to be successful. It is believed that if Ethiopian athletics had previously been aided by modern training, scientific method implementation, infrastructure and the current beginnings were improved and applied, the Ethiopian economy would have been better supported by athletic sport and the running dominancy will be improved all over the world competition.

So, the world athletics concerned body should give much more attention and considering to the competition area and training area nears to balanced. Ethiopian athletics federation and sport commission should be well thought-out of athletics training and project plan based on this research results that almost all Ethiopian altitudes are very suitable to long and middle distance running athletes production, because all the biggest cities in the world had been built at lower altitudes indicated on the above table shown us that Ethiopian long distance runners are beneficial with their living and grown up environment.

Based on this research result Ethiopian athletics federation and sport commission can distribute athletics projects toward all over the county to allow the citizen economic improvement and sport business improvement. If a lot of efforts of the Ethiopian government applied on athletics sport the country economic growth will be improved. Because long distance running in Ethiopia no need of sophisticated recourses instead of it, Ethiopian long and middle distance running runners success is the athletes motivation to alleviate their economic problems and to achieve economic goal. The athletes` strong desire came from their role models who solved their economic problem through long and middle distance running competition participation.

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