The Role of Medicinal Plants in Traditional Medicine in Adwa District, Tigray, Northern Ethiopia

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Authors’ contributions

This work was carried out in collaboration among all authors. Author TA designed the methods and all authors interpreted the results and wrote the paper. All authors have attributed to, seen and approved the paper contributed equally to this work.

ABSTRACT

In Ethiopia, medicinal plants had been used since ancient time and became an important source of health care. Though majority of the people in the study area depend on ethnomedicine to manage different ailments, the indigenous knowledge largely is not documented. As a result, an ethnobotanical survey was conducted with the objective of assessing the role of medicinal plants in traditional medicine. Data was collected by using semi-structured interview and group discussion. Twenty informants were purposefully selected based on indigenous knowledge and gender. Ethnobotanical data was analyzed with descriptive statistics and expressed in tables and flow charts. A total of 25 medicinal plants (22 families) recorded to treat human and livestock ailments.

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Medicinal plant habit analysis indicates that shrubs occupy the highest proportion (36%), followed by trees and herbs (28% for each) and climbers (8%). The most commonly used plant parts in the study area were leaves and roots. Although medicinal plants play a great role in the society, their sustainability is declining through time in the study area due to the increasing number of users, improper uses of the plants and poor conservation. Therefore, the conservation of these medicinal plants would be important.

Keywords: Ailment; ethnombotany; herbalist; medicinal plant; traditional medicine.

1. BACKGROUND

Traditional medicine is the sum of total knowledge and practices used in diagnosis, prevention and elimination of physical, mental, or societal imbalance and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in writing [1]. It incorporates plant, animal and mineral based medicines, spiritual therapies, manual techniques and trial and errors, applied individually or in combination to treat, diagnose and prevent illness, or maintain wellbeing [2]. In Ethiopia, the use of medicinal plants had been practiced since the ancient time and become an important source of health care system [3]. Medicinal plants are the main sources of traditional medicine for the rural population. Healers play an important role in the primary health care of the rural people and are of high demand on the population who could not afford the cost of modern medication [4].

The vast majorities of Ethiopian population live in rural areas where the health care coverage is low and the existing public sector resources are being stretched to the limits and one of the greatest challenges is determining how best to narrow the gap between the existing service and population need [5]. The study of pharmaceutical drug use in Ethiopia showed that about 35% of the patients did not obtain the prescribed drugs due to lack of money [6]. However, most traditional medicine is delivered either free or with relatively low cost which contributes to the use of rural based healers for community primary healthcare [7]. Most of the indigenous knowledge which is still available among traditional medicine practitioners is passed from generation to generation via verbal communication and the existence of medicinal plants is declining through time [8]. Despite the significant role of medicinal plants in national primary healthcare in Ethiopia, (Abebe and Ayehu, 1993), little attempts have been made to document and validate the information. However, this indigenous knowledge is seriously threatened due to various natural and anthropogenic factors. Therefore, this research is aimed to assess and document the role of medicinal plants in Adwa District, Northern Ethiopia.

2. MATERIALS AND METHODS

2.1 Description of the Study Area

The study was conducted in Adwa district which is situated in the central zone of Tigray National Regional State, Ethiopia. It's found at about 1006 km North of Addis Ababa and is located at 14° north latitude and 38° east longitude. The area is surrounded by highlands and has an elevation of 1650-1990 meters above sea level. It receives an annual rainfall of 600 - 650 mm and its monthly mean temperature is 22°C which ranges from a minimum of 13°C to a maximum of 27.2°C. (National Metrological Service Agency, Mekelle Branch Office; Adwa district statistical agency, 2013; unpublished data).

2.2 Sample Size and Sampling Technique

A total of 20 herbalists were selected based on gender and indigenous knowledge regarding to the medicinal plants plus their full consent. Ethnobotanical data were collected from traditional medicine practitioners by using semi structured interview, and group discussions. The intellectual property rights were discussed and the name of practitioners was not mentioned. No compensation was given to the respondents. From the selected twenty informants, 75% were females which have been done purposely to assess the role of females in traditional medicine in the study area. No pre survey visit was done.

2.3 Data Analysis

The collected data were analyzed by using simple descriptive statistics and expressed in the form of graphs and tables.
3. RESULTS AND DISCUSSION

3.1 Medicinal Plant Distribution

A total of 25 medicinal plants which belongs to 22 families were recorded in the study area. Out of these, 16 are used to treat human, 10 for treating livestock and 12 for treating both human, and livestock ailments.

The growth form analysis result shows that shrubs occupy the highest proportion (36%), followed by tree and herbs constituting 28% each, and climbers constitute 8% (Fig. 1). Similar to our finding, a relatively higher number of shrubs and herbs were previously reported elsewhere in Ethiopia; western Ethiopia [9] and southwestern Ethiopia [10]. Similarly, other studies undertaken in Boosat sub-district, central eastern Ethiopia [11], Gimbi, western Ethiopia [12], Wonago district, southern Ethiopia [13], and Mana Angetu district, southeastern Ethiopia ([14] showed that shrubs followed by herbs and trees are the most frequently used growth forms. Such higher proportion of shrubs use in the study area and in other locations is indicative of over utilization and hence needs special conservation measures to assure longevity. The higher proportion of shrubs in this study will be associated with the demographic condition of the study area suitable for shrubs and the society engagement towards shrubs. This study was also found to be different from other studies [15,16,17,18] where herbs occupy the highest proportion. The reason why herbs are being investigated by many researchers as widely utilized is the use of herbaceous medicines seems valuable since they can replace themselves easily and they are ubiquitously easily accessible given a reasonable climatic condition. Generally, such variations could be attributed to agro- ecological diversity of the country that favors different plant forms, and socio-cultural factors determine specific knowledge in different communities [19].

The most commonly used plant parts are leaves (52%) followed by root (24%) and seed (8%), respectively (Fig. 2). This is consistent with the finding of [20,18,10,21,22,23] where leaves occupy the leading rank among the harvested plant parts. Given that leaves constitute the most frequently sought plant parts in this study; the threat to the destruction of medicinal plants due to plant part extraction appears reasonably reduced. However, the dependence on roots, rhizomes, bulbs, barks, stems or whole parts of plant results in consequences from both ecological point of view and from the survival of the medicinal plant species [24].

In this study, most of the medicinal plants were prepared in the form of crushed/grinded and homogenized with ingredients such as water, cheese, honey and coffee. The route of administration includes drinking, eating/chewing, inhalation, smearing, tying in some body parts and smelling. These use methods are usually common and widely used and the ingredients may vary among the type of plants and the nature of diseases [25].
3.2 Medicinal Plants Used for the Treatment of Human Diseases

According to the information obtained from healers, the most widely distributed human disease in the study area includes hypertension, asthma, abdominal pain, common cold, skin infection and others (Table 1). Herbalists use different diagnosis and treatment methods depending on the type of ailment. Patient or their attendants are commonly asked for symptoms observed and the duration of the health problem and accordingly the prescription is ordered. Practitioners informed that abdominal pain is serious and frequently occurring due to the lack of hygiene, that is associated with the lack of proper and continuous awareness to the society and economic problems.

The use-value (UV) index was calculated as: 
\[ U_{vc} = \sum U_{i}/ns \] 
where \( U \) is the sum of the total number of use citations by all informants for a given species, divided by the total number of informants (ns) [26]. The result is illustrated in Table 2.

3.3 Medicinal Plants Used for the Treatment of Livestock Diseases

The herbalist use different herbal preparations to treat livestock health problems. Abdominal pain, skin infection, leg inflammation and dry cough are the most popular livestock ailments in the study area (Table 3). Most of the medicinal remedies are prepared from single medicinal plants either crushed/grinded or powdered. These remedies administered orally.

3.4 Medicinal Plants for the Treatment of Both Human and Livestock Disease

According to this study, medicinal plants listed in Table 4 were recorded to treat both human and livestock health problems. The data obtained from the traditional medicinal practitioners revealed that about 48% of the medicinal plants cure and prevent both ailments. This implies that, those medicinal plants have higher risk of sustainability due to repeated and continuous use than single used ones. Therefore, as indicated by Fig. 3, the medicinal plants of having medicinal value for both ailments occupy 48% and it indicates the medicinal plants providing curative and preventive role for both human and livestock health problems have frequent chance of utilization and so do the medicinal plants against human ailments. So, sustainable conservation and use approaches of those medicinal plants have to be seriously considered.
Table 1. Medicinal plants used for treatment of human disease

| S. no | Disease treated           | Local name of medicinal plant | Scientific Name/Family                      | Habit | Part used | Method of usage          | Preparation method                      |
|-------|---------------------------|-------------------------------|--------------------------------------------|-------|-----------|--------------------------|----------------------------------------|
| 1     | Hypertension              | Lemon                         | *Citrus auranifolia* (Rutaceae)            | T     | L         | drinking                 | Crush and mix with water               |
| 2     | Wen                       | Adaaho                        | *Rumex nepalensis* (Polygonaceae)          | H     | R         | Drinking and smear      | Grind and mix with water               |
| 3     | Dental disease            | Zingibel                      | *Zingiber officinal* rosal                 | H     | Rh        | Drinking/Chewing        | Dissolve the powder with water         |
| 4     | Abortion                  | Shibti                        | *Phytolacca dodecandra* L. Herit           | Sh    | L         | Drinking                 | Mix with water and coffee              |
| 5     | Abdominal pain            | Awesda                        | *Nigella sativa* L.(Ranunculaceae)         | H     | Se        | Drinking                 | Grind and with homogenize water        |
|       |                           | Shinfea                       | *Lepidium sativum* L.(Brassicaceae)        | H     | Se        | Drinking                 | Crush the seed & mix with water        |
| 6     | Helmints, abdominal pain  | Hambaha mbo                   | *Senna singueana* (Fabaceae)              | Sh    | R         | Drinking                 | Grind and mix with water               |
| 7     | Asthma                    | Tikurberb ere                 | *Schinus molle* L.                         | T     | L         | Smell                    | Grinding                               |
| 8     | Common cold               | Nech bahairzaf                | *Eucalyptus camaldulensis*. Dehnh          | T     | L         | Steam bath inhalation   | Grind the leaf and boil with water     |
| 9     | Vaginal bleeding          | Demakese                      | *Ocimum lamifolium* Hochst (Lamiaceae)     | Sh    | L         | smearing                | Crush and smear in the vaginal part    |
| 10    | Nephritis, tapeworm       | Duaba                         | *Cucumis melo* (Cucurbitaceae)             | CI    | Fr        | Eating                   | Boil with water                        |
| 11    | Bone fracture             | Gerby                         | *Hypoestes forskaoli* (vahl) *R.Br*        | Sh    | R         | Tie                      | Cut the root parts and tie the damaged part |
| 12    | Snake bite                | Mekmeko                       | *Rumex abyssinicus* Jacq. (Polygonaceae)   | H     | R         | Chew and swallow        | Crush the root parts and mix with honey |
| 13    | Bone disease              | Tsedidima                     | *Juniperus procera* (Cupressaceae)         | T     | Stb       | Amulet                   | Crush the stem bark and amulet         |
| 14    | Malaria                   | Neem                          | *Azadirachta indica* A. Juss. (Meliaceae)  | T     | L         | Drinking                 | Crush the leaf and mix with water      |
| 15    | Quauchasha                | Bsana                         | *Croton macrostachyus* (Euphorbiaceae)     | T     | L         | Painting                 | Take the leaf bud and paint the fluid on the skin |

Foot note: Growth Habit: CI = Climber, H = Herb, Sh = Shrub, T = Tree; Plant part: Fr = Fruit, L = Leaf, R = Root, Rh = Rhizome, Se = Seed, Stb = Stem bark
Table 2. Use-Value (UV) index of medicinal plants in the study area

| S. no. | Name of medicinal plant                  | Number of citation by informants | Total number of informants | UV index |
|--------|----------------------------------------|----------------------------------|----------------------------|----------|
| 1      | Azadirachta indica A. Juss             | 15                               | 20                         | 0.75     |
| 2      | Cadia purpurea (picc.) Ait             | 13                               | 20                         | 0.65     |
| 3      | Calpurnia aurea (Alton) Benth         | 7                                | 20                         | 0.35     |
| 4      | Citrus auranifolia                    | 20                               | 20                         | 1        |
| 5      | Cucumis dipsaceus Ehrenb.             | 20                               | 20                         | 1        |
| 6      | Cucumis melo                           | 16                               | 20                         | 0.8      |
| 7      | Croton macrostachys                    | 18                               | 20                         | 0.9      |
| 8      | Eucalyptus camaldulensis. Dehn         | 5                                | 20                         | 0.25     |
| 9      | Euclea natalensis L                   | 9                                | 20                         | 0.45     |
| 10     | Hypoestes forskoali (vahl) R.Br       | 13                               | 20                         | 0.65     |
| 11     | Jasminum abyssinicum Hochst. ex DC.   | 20                               | 20                         | 1        |
| 12     | Juniperus procera                     | 19                               | 20                         | 0.95     |
| 13     | Lepidium sativum L.                   | 20                               | 20                         | 1        |
| 14     | Nigella sativa L.                     | 20                               | 20                         | 1        |
| 15     | Ocimum lamifolium Hochst              | 20                               | 20                         | 1        |
| 16     | Phytollacca dodecandra L. Herit       | 20                               | 20                         | 1        |
| 17     | Rumex abyssinicus Jacq.               | 19                               | 20                         | 0.95     |
| 18     | Rumex nepalensis                      | 19                               | 20                         | 0.95     |
| 19     | Ruta chalepensis L.                   | 20                               | 20                         | 1        |
| 20     | Schinus molle L.                      | 18                               | 20                         | 0.9      |
| 21     | Senna singueana                       | 17                               | 20                         | 0.85     |
| 22     | Silene macrosolen.A.Rich              | 10                               | 20                         | 0.5      |
| 23     | Solanum incanum L.                   | 20                               | 20                         | 1        |
| 24     | Ximena amerciana L.                   | 14                               | 20                         | 0.7      |
| 25     | Zingiber officinal roscual            | 20                               | 20                         | 1        |
### Table 3. Medicinal plants for treatment of livestock disease

| S. no | Disease treated | Local name of medicinals plant | Scientific name/Family | Habit | Part used | Method of usage | Preparation method |
|-------|----------------|--------------------------------|------------------------|-------|-----------|-----------------|-------------------|
| 1     | Spleen         | A Sheleno                      | Cadia purpurea (picc.)  | Sh    | L         | Drinking        | Grind and mix with water |
|       |                |                                | It (Leguminosae/Papilion ideae) |       |           |                 |                   |
|       |                |                                | Calpurnia aurea (Aiton) Benth. (Fabaceae) |       |           |                 |                   |
| 2     | Depression, lice, bloating, dry cough, Abdominal pain | Digita (Hitsawutse) |                          | Sh    | L         | Drinking        | Grind and mixing with water |
| 3     | Belly ache, Snake bite, Insect bite, stomach pain/ diarrhea, dry cough, Abdominal pain | Hafafelo | Cucumis dipsaceus Ehrenb. (Cucurbitaceae) | Cl    | R         | Drinking        | Grind and mix with water |
| 4     | Rabies         | Kuliaw                         | Euclea natalensis L. (Ebenaceae) | T     | R         | Eating          | Crushing the root parts of the plant and mixing with cheese |
| 5     | Eye disease, Tape worm, vomiting | Habi-tselim                  | Jasminum abyssinicum Hochst. ex DC.(Oleaceae) | T     | L         | Stain/ drinking | Grind and mix with water |
| 6     | Halafin        | Shinfae                        | Lepidium sativum L. (Brassicaceae) | H     | Se        | Drinking        | Grind and mixing with water |
|       |                |                                | Rumex nepalensis (Polygonaceae) | H     | L         | Smearing        | Grind and mix with water |
| 7     | Skin infection | Adahon                         | Silene macrosolen.A.Rich (Caryophyllaceae) | Sh    | L         | Smoking         | Grinding and smoke |
| 8     | Abdominal pain | Engule                         | Solanum incaum L. (Solanaceae) | H     | R         | Drinking        | Crushed and mixing with water |
| 9     | Vomiting, leech infestation, tonsillitis | Mileo                        | Ximenia americana L.(Ximeniaceae) | Sh    | L         | Drinking        | Grinding the leaf part of the plant and mixing with water |

*Foot note: Growth Habit: Cl = Climber, H = Herb, Sh = Shrub, T = Tree; Plant part: L= Leaf, R = Root, Se = Seed*
Table 4. Medicinal plants used for treatment of both human and livestock disease

| S. no | Disease treated                                      | Local name of medicinal plant | Scientific name/Family                          | Habit | Part used | Method of usage | Preparation method                                      |
|-------|------------------------------------------------------|-------------------------------|------------------------------------------------|-------|-----------|----------------|-------------------------------------------------------|
| 1     | Skin infection, termite bite, Petriasis Versicolor,  | Nim                           | Azadirachta indica A. Juss. (Meliaceae)         | T     | L         | Drinking       | Crush the leaf and mix with water                     |
|       | Leech infestation, Poultry disease, Epilepsy         |                               |                                                 |       |           |                |                                                       |
| 2     | Headache                                             | Shelen                        | Cadia purpurea (picc.) Ait (Leguminosae/Papilionoideae) | Sh    | L         | Drinking       | Grind and mix with water                              |
| 3     | Malaria, anthrax and Abdominal pain                  | Hafafelo                      | Cucumis dipsaceus Ehrenb. (Cucurbitaceae)        | Sh    | R         | Drinking       | Grind and mix with water                              |
| 4     | Skin infection                                       | Gerbiya                       | Hypoestes forsakaoli (Vahl) R.Br (Acanthaceae)   | Sh    | L         | Tie            | Cut the root parts and tie the damaged part           |
| 5     | Abdominal pain, tonsillitis, diarrhea                | Shinfa                        | Lepidium sativum L. (Brassicaceae)               | H     | Se        | Drinking       | Grind and mixing with water                           |
| 6     | Wen                                                  | Mekmeko                       | Rumex abyssinicus Jacq. (Polygonaceae)           | H     | R         | Smearing       | Crush the root parts and mix with honey               |
| 7     | Snake bite                                           | Adahon                        | Rumex nepalensis (Polygonaceae)                  | H     | R         | Chew and swallow | Grind and mix with water                              |
| 8     | Common cold/ Evil sprit                              | Tenadam                       | Ruta chalepensis L. (Rutaceae)                   | H     | L         | Drinking/ Stem Inhalation Smell                      | Grind and mixed with water/ Garlic                    |
| 9     | Abdominal pain, Asthma , diarreha                   | Tikurberbere                  | Schinus molle L. (Anacardiaceae)                 | T     | L         | Smell          | Grindng                                               |
| 10    | Amoeba, abdominal pain, snake bite                   | Hambahambo Engule             | Senna singueana (Fabaceae)                       | Sh    | R         | Drinking       | Grind and mix with water                              |
| 11    | Abdominal pain                                       |                               | Solanum incanum L. (Solanaceae)                 | H     | R         | Drinking       | Crushed and mixing with water                        |
| 12    | Sneezing and dry cough                               | Zingibl                       | Zingiber officinale roscal (Zingibereaceae)      | H     | Rh        | Drinking       | Dissolve the powder with water                        |

Foot note: Growth Habit: $H = \text{Herb}$, $Sh = \text{Shrub}$, $T = \text{Tree}$; Plant part: $L = \text{Leaf}$, $R = \text{Root}$, $Rh = \text{Rhizome}$, $Se = \text{Seed}$
Table 5. Fidelity Level (FL) of medicinal plants for human, livestock and both ailments

| S. N | Disease treated                                      | Local name of medicinal plant | Scientific name of the medicinal plant | Target treated | FL |
|------|------------------------------------------------------|------------------------------|----------------------------------------|----------------|----|
| 1    | Hypertension                                         | Lemon                        | Citrus auranifolia                      |                |    |
| 2    | Wen, Skin infection, Snake bite                      | Adaaho                       | Rumex nepalensis                       |                |    |
| 3    | Dental disease, Sneezing, dry cough                 | Zingibel                     | Zingiber officinal roscol              |                |    |
| 4    | Abortion                                             | Shibli                       | Phytolacca dodecandra L. Herit         |                |    |
| 5    | Abdominal pain, Halafin, tonsillitis, diarrhea      | Awesda                       | Nigella sativa L.                      |                |    |
| 6    | Helments, Amoeba, Abdominal pain, Snake bite        | Hambahambo                   | Senna singueana                        |                |    |
| 7    | Asthma                                               | Tikurberbere                 | Schinus molle L.                       |                |    |
| 8    | Common cold                                          | Nech bahairza                | Eucalyptus camaldulensis.              |                |    |
| 9    | Vaginal bleeding                                     | Demakese                     | Ocimum lamifolium Hochst               |                |    |
| 10   | Nephritis, tapeworm                                  | Duaba                        | Cucumis melo                           |                |    |
| 11   | Bone fracture, Skin infection                        | Gerbiya                      | Hypoestes forskaoli (vahl) R.Br       |                |    |
| 12   | Skin infection, Wen                                  | Mekmeko                      | Rumex abbyssinicus Jacq.              |                |    |
| 13   | Bone disease                                         | Tsedidima                    | Juniperus procera                      |                |    |
| 14   | Malaria, Skin infection, termite bite, Petriasis Versicolor, Leech infestation, Poultry disease, Epilepsy | Neem                          | Azadirachta indica A. Juss.            |                |    |
| 15   | Quaqucha                                             | Bsana                        | Croton macrostachyus                   |                |    |
| 16   | Headache                                             | Shelen                       | Cadia purpurea (picc.)                 |                |    |
| 17   | Depression, lice, bloating, dry cough, Abdominal pain | Digita (Hitsawutse)          | Calpurnia aurea (Aiton) Benth          |                |    |
| 18   | Malaria, anthrax, Abdominal pain, Belly ache, Snake bite, Insect bite, diarrhea, dry cough | Hafafelo                     | Cucumis dipsaceus Ehrenb.              |                |    |
| 19   | Rabies                                               | Kuliaw                       | Euclea natalensis L                    |                |    |
| 20   | Eye disease, Tape worm, vomiting                     | Habi-tselim                  | Jasminum abbyssinicum Hochst          |                |    |
| 21   | Skin infection                                       | Sersaero                     | Silene macrosolen.A.Rich              |                |    |
| 22   | Abdominal pain                                       | Engule                       | Solanum incanum L.                    |                |    |
| 23   | Vomiting, leech infestation, tonsillitis             | Mileo                        | Ximenia americana L.                   |                |    |
| 24   | Common cold, Evil sprit                              | Tenadam                      | Ruta chalepensis L.                    |                |    |
| 25   | Abdominal pain, Asthma , diarrhea                    | Tikurberbere                 | Schinus molle L.                       |                |    |
3.5 Gender based Medicinal Plant Knowledge

Gender significantly predicts medicinal plant knowledge [27]. Scholars reported males and elders have comparatively higher proportion of medicinal plant knowledge than females and young people [28]. This is due to their personal experiences using these plants and exposure to the field [29]. In this study 75% of the medicinal practitioners were females, even if purposefully selected to assess their role in traditional medicine and of course found to be stakeholder to field. This showed that females in their ethnic groups have a great role in transferring and seeking indigenous knowledge on traditional medicine. Therefore, gender based indigenous knowledge is not exactly biased that both males and females have their own contribution. It may be varied in different ethnic societies. The Fidelity level (FL), the percentage of informants who mentioned the uses of certain plant species to treat a particular ailment in a study area, was calculated as; FL= Np/ (N×100); where Np is the number of informants that reported a use of a plant species to treat a particular disease, and N is the number of informants that used the plants as a medicine to treat any given disease [26] and illustrated in Table 5.

4. CONCLUSION AND RECOMMENDATIONS

This research found 25 medicinal plants providing curative and preventive role for human, (60%), livestock (40%) and both (48%). Generally, this finding indicates that medicinal plants play a crucial role in traditional medicine to address the health of the society via indigenous knowledge. This research reveals the traditional medical practitioners treat both human and a livestock health problem in their ethnicity which is an indicative of traditional medicine is practiced by different societies. Moreover, the study investigates the role of females in traditional healing system. This is because indigenous knowledge is not biased on gender, race, religion and others. But its transfer to generations has limited the outstanding status of the field due to verbal communication. Therefore, the government has to design a strategy to better develop the sector and conserve the medicinal plant species and the skill of practitioners because it is the corner stone for modern drug development innovations.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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